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U.S. DEPARTMENT OF AGRICULTUR

Farm Adjustments and Income on Typical Corn Belt Farms

By

WYLIE D. GOODSELL, Senior Agricultural Economist
Bureau of Agricultural Economics

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ACKNOWLEDGMENT

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FOREWORD

Major adjustments are being made in this Nation's expanding agriculture to supply the needs of the armed forces and the civilian populations of the United Nations and the occupied countries. The prosecution of the war and the occupation of more countries will inevitably call for even greater adjustments. Perhaps the greatest are still ahead when the world will be involved in reconstruction.

The type of study which is reported on in this circular has particular value to those who formulate agricultural policy, to administrators of agricultural programs, and to students of agriculture in general, when they are evaluating changes that have taken and are taking place on given types of farms, in peacetime and in wartime. It supplies a yardstick by which the results and the feasibility of certain proposals for current and post-war adjustments in farming may be measured. It is valuable not only for appraisal of the changes affecting important groups in the farming economy but for ascertaining the impact on the physical organization of individual farms and on the economic well-being of their operators.

Such work contributes significantly to the guidance of production during periods of widespread change and supplies first-hand information as to where increased production is possible and where such production can be obtained most effectively and with least difficulty during emergencies and over a longer period. Stresses and strains on the agricultural plant are assessed and farmers' production possibilities are learned through analyzing the physical organizations of typical farms by type and then appraising their resources for production.

The prospective effects of expansion or contraction of production and of various agricultural pricing proposals on the farmers' cost and price relationships can be measured directly by such studies. Significant byproducts are the data on changes in income levels, prices, costs, and sources of income. Comparisons of income from year to year are made possible among cotton, corn, wheat, tobacco, fruit, truck, and dairy farmers; and income comparisons between farmers and nonfarmers can be carried much farther than heretofore.

Since this project was initiated, analyses have been made, for the years 1910–42, of the organizations and incomes of approximately 17 types of farms that are typical of important farming groups in the cotton, corn, wheat, tobacco, and dairy areas of the United States. Brief discussions of each of these farm organizations, together with appropriate charts on incomes and tables on organization, have appeared in issues of The Agricultural Situation, a monthly publication of the Bureau of Agricultural Economics. The study procedure has been modified and improved from time to time, and even as this circular is in process of publication the procedure is being modified and improved. The procedure as given here is in simplified form. Many technical details and formulae have been omitted. Much of the effort on the project to date has been directed toward developing sound procedure, which would be appropriate for study of any type and size of farm in any given agricultural region.

Time has permitted study of only the typical, or modal size, farm by major types, illustrated in this report for groups of Corn Belt farms. The procedure used is equally appropriate for reflecting periodically the relative economic well-being of any group of farms considered significant within a State or within a type-of-farming area in a State.

Interest in developing similar studies for States and type-of-farming areas has been mounting. The eventual significance of such work will be in direct proportion to the completeness with which all important farming groups may be covered by a uniform procedure which would reflect the changes in welfare of farmers in all sections.

Sherman E. Johnson,
Head, Division of Farm Management and Costs.

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By Wylie D. Goodsell, *Senior Agricultural Economist*

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ADJUSTMENTS AND INCOME

How well can we expect typical farmers to adjust to new demands and changed conditions? This is a crucial question in this war. It will be equally important during the post-war adjustment. Taking the Corn Belt as an example, we now have a 33-year record of farm adjustments and income on typical farms, through war and peace and through good years and bad, as measured by prices, costs, drought, depression, and demand. From a study of this record, prognostications as to appropriate adjustments and as to farmer reaction, at least in the Corn Belt, to changes yet to come, might perhaps be figured with some feeling of certainty.

Good times and bad times have had their effects upon the incomes and well-being of all farmers, but their influences have been far different from farm type to farm type, and from area to area. Because their farm organizations were more flexible and their land more suitable for all-round cropping, some farm operators have been in a far better position to take advantage of their opportunities, and thus to live through their misfortunes.

Adjustments and changes in farm production during the last 30 years, and more particularly during the last decade, have been far more significant and broader in scope than is generally recognized. Typical Corn Belt farmers have increased their size of farm, their emphasis on livestock production, and their use of machinery and power equipment. The speed with which these changes in crop and livestock systems have been made and the speed with which technological changes have been adapted or utilized have varied widely from farming area to farming area.

Since 1910–14—the present parity base—typical Corn Belt farmers have moved up with the tide of technology that has given each of them an opportunity to handle more resources more skillfully. Labor-saving machines, better livestock, improved crop varieties, better rotations, and other good farming practices have been put into use. These, together with more appropriately sized operating units, appear to have yielded almost continually increasing returns.

This circular is therefore devoted to: (1) Analyzing the farm organization and changes in production of typical family operated farms in the Corn Belt from 1910–42, (2) ascertaining the degree to which types of farms are mechanized and the influence of technological developments on farm organization, and (3) analyzing the effects of shifts in production and changes in farm organization, farm practices and efficiencies, mechanization and adjustment, on the income and the economic well-being of operators on typical family farms in the Corn Belt.

Sources of the Data

Primary sources of data for this study have been the information available from published statistics, particularly the United States Census of Agriculture, the annual reports of the secretaries of agriculture in the Corn Belt States, the crop and livestock reports and miscellaneous publications of the United States Department of Agriculture, and publications of the State experiment stations. Considerable information has been obtained from the more detailed studies, such as farm-management surveys and farm-accounting projects, conducted by the economic sections of the land-grant colleges in the Corn Belt. Statistical data have been supplemented to some degree with information and general observations obtained from specialists who have first-hand knowledge of farming in the sections of the Corn Belt covered by this study.

AREA STUDIED

This circular applies to the Corn Belt proper. About 130 Corn Belt counties were selected as representative of the farming areas; the study here reported includes the major portions of northwestern and west central Ohio; the north and central portions of Indiana and Illinois; all of Iowa; the northern portion of Missouri and the northeastern and east central portions of Nebraska (fig. 1). Sections adjacent to large cities and milksheds were omitted.

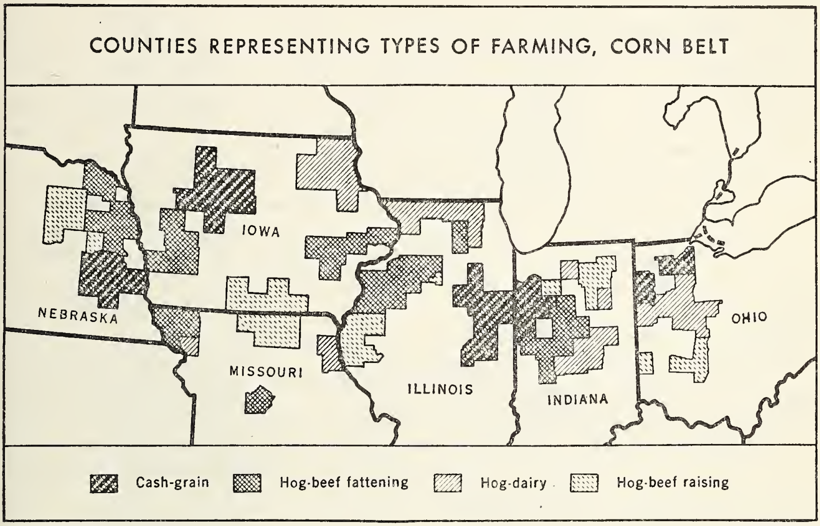

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FIGURE 1.—MAP SHOWING COUNTIES REPRESENTING THE FOUR MAJOR TYPES OF FARMING IN THE CORN BELT PROPER, 1910-42.

TYPES OF FARMS CONSIDERED

Only the major types of farms in the Corn Belt and within these types only the most common, or modal-size, farms were considered. It was thought that any minor types would probably be a combination of two or more of the types presented here and that general shifts and adjustments in the farming programs of these minor types of farms may be deduced from the changes made by operators of major types.

The types of farms considered in this circular are the following: Hog-dairy; cash-grain; hog-beef breeding and fattening; and hog-beef raising. Table 1 gives some of the details on organization and income of these farms.

Hog-dairy farms are farms on which a combination of the hog and dairy enterprises assumes considerable proportions. The hog enterprise generally contributes more to the total income than does the dairy enterprise, but it also requires considerably more feed and less labor. Operators of these farms occasionally buy some farm-grown feeds to carry their livestock programs, but the quantity purchased is usually small. In contrast, cash-grain farm operators sell most of

TABLE 1.—*Organization of typical Corn Belt farms by type, 1910–14 and 1938–42*

Item	Unit	Hog-dairy		Cash-grain		Hog-beef breeding fattening		Hog-beef raising	
		1910–14	1938–42	1910–14	1938–42	1910–14	1938–42	1910–14	1938–42
Land in farm	Acre	120	135	168	219	168	199	145	170
Land cultivated	Acre	77	89	134	182	119	137	82	96
Corn	Acre	27.4	30.5	68.1	74.5	57.8	59.5	36.3	34.0
Corn yield	Bushel	39.4	52.0	37.4	49.8	36.0	46.0	31.8	37.7
Soybeans	Acre	------	2.9	------	29.5	------	3.4	------	4.6
Small grain	Acre	27.3	28.2	47.4	46.9	31.9	37.3	22.8	28.5
Hay	Acre	18.3	19.3	16.0	14.3	27.1	29.9	20.3	22.3
Rotation pasture and miscellaneous.	Acre	4.1	8.5	2.8	17.1	2.0	10.3	3.0	10.0
Permanent pasture	Acre	37.5	41.9	29.5	32.8	43.0	55.8	57.6	68.8
Cows milked	Number	9.3	11.9	3.3	4.3	3.1	3.3	4.9	4.7
Work animals	Number	4.2	3.1	7.3	2.0	6.5	4.1	5.2	3.6
Laying hens	Number	103	115	107	113	109	115	103	99
Hogs sold	Hundredweight	88	122	69	107	117	175	66	77
Cattle sold	Hundredweight	26	31	27	34	144	149	57	56
		Proportion of gross income from various sources							
			1938–42		1938–42		1938–42		1938–42
Corn	Percent		1.7		33.3		0.9		5.2
Soybeans	Percent		1.7		13.4		1.5		4.1
Other crops	Percent		3.0		9.4		2.8		5.2
All crops			6.4		56.1		5.2		14.5
Hogs	Percent		38.1		20.6		37.1		31.3
Cattle	Percent		9.6		6.8		41.0		24.0
Sheep and poultry	Percent		4.3		1.6		3.2		6.8
All livestock			52.0		29.0		81.3		62.1
Dairy products	Percent		29.4		4.2		3.2		8.8
Other livestock products	Percent		7.1		3.3		4.3		7.6
All livestock products			36.5		7.5		7.5		16.4
Miscellaneous and Government payments.	Percent		5.1		7.4		6.0		7.0
Total			100.0		100.0		100.0		100.0

their crops instead of feeding them; comparatively little livestock is produced on these farms, although considerably more emphasis has been given to this enterprise on these farms during recent years. Operators of hog-beef breeding and fattening farms usually buy considerable feed, particularly corn. They maintain a herd of stock cows; their calves are fattened along with a few purchased calves of the same age and description. During the last 5 years these farmers have sold annually approximately 15,000 pounds of fat beef and 15,000 pounds of live hogs. Hog-beef raising farms are the least specialized of the four types. Their operators receive a substantial part of their income from each of four sources—hogs, cattle, livestock products, and crops. They breed and raise cattle, but usually do not fatten them before selling.

SIZE OF FARM

These typical farms are mainly family operated, and in size and organization are just like thousands of other farms in the area. Perhaps many smaller farms and many larger farms have several factors in common with these. Subsistence or part-time farms and low-income farms have problems and adjustments the analysis of which remains for another study. The farms considered here are commercial family-operated farms and are far more common than other sizes and types in the Corn Belt. They are considered to be representative of large segments of Corn Belt farming. They range in size from the 135-acre hog-dairy farm to the 220-acre cash-grain farm. The total man labor required to operate them ranges from approximately 3,900 hours on hog-beef raising farms to 5,200 hours on hog-dairy and hog-beef breeding and fattening farms.

Typical farms here have increased in size since 1910. During the 30-year period hog-dairy farms have increased about 15 acres, hog-beef raising about 30 acres, hog-beef fattening about 35 acres, and cash-grain farms about 55 acres (table 2).

Acres-in-farm is only one criterion of size of farm or volume of business. The ratio of cultivated land to total farm land, use of cropland, and livestock programs should be considered as additional criteria of size of business. For example, beef raising and dairy farming are built around appropriate pastures and roughages and could be rather large in acres but small in volume of business. Concentrate feeds are less important in these systems of farming than in beef fattening or hog production.

The proportion of total farm land cultivated averages about 66 percent for hog-dairy farms, 57 percent for hog-beef raising, 70 percent for hog-beef fattening, and 83 for cash-grain farms. The ratio of hay and pasture to grains is much higher on hog-dairy and hog-beef raising farms than on hog-beef fattening and cash-grain farms (table 1).

CROPPING SYSTEMS

ACRES OF CROPS

In a glance over the years at the cropping systems of typical Corn Belt farms attention is centered on five facts: (1) The increase in acres of cultivated land on all types of farms, (2) curtailment of corn acreage since the early thirties, (3) increase in soybean acreage, (4) in-

TABLE 2.—*Total acres per farm, and acres cultivated, typical family operated farms, Corn Belt, 1910–42* [1]

Period	Hog-dairy		Cash-grain		Hog-beef breeding and fattening		Hog-beef raising	
	Farm	Cultivated	Farm	Cultivated	Farm	Cultivated	Farm	Cultivated
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
1910–14	120	77	168	134	168	119	145	82
1915–19	122	78	176	142	174	122	150	87
1920–24	123	80	182	151	178	126	152	90
1925–29	129	84	190	158	184	131	156	94
1930–34	131	86	202	171	187	132	154	93
1935–39	133	87	212	179	191	134	161	95
1940–42	136	87	222	183	202	138	173	96

[1] Includes rotation pasture, idle and fallow.

crease in acreage of alfalfa hay, and (5) increase in acreage of rotation pasture. Several of these changes have been under way for some time whereas others are comparatively recent.

Increase in cultivated acreage has been somewhat gradual. This is particularly true on the smaller farms and on the livestock farms. Livestock farms compared with cash-grain farms have been slower to increase because reductions in labor requirements have not been so great on livestock as on crops. As for smaller farms, their changes have been slower because mechanized equipment for effective use on small farms has not been stressed by manufacturers until recently. Thus, the operator of the small farm, even though it were a grain or crop farm, has not been able to increase the output per man or to increase the acreage of crops per man as have operators on the larger farms where adaptable labor-saving devices have been more numerous.

Acreage of corn per farm increased with the size of farm until 1933 when a majority of farmers restricted this acreage under the agricultural program that began in that year. Cash-grain farmers made the greatest reduction and hog-dairy farmers the least reduction. Cash-grain farmers grew only 88 percent as many acres during the years 1933 to 1936, inclusive, as they grew in 1932. (In 1937, the Agricultural Adjustment Program was not so effective in restricting acreages and the acreage in corn almost reached the 1932 record of 90 acres on these farms; the next year the acreage declined and continued to decline until 1942.) They also reduced their acreage of oats and barley by 11 percent during the years 1933–36. The decline in acreage of oats and barley has continued on these farms; in 1940–42 the acreage was only 68 percent of that in 1932. But the increase in acreage of soybeans has been very marked on these farms. The typical cash-grain farmer grew nearly 40 acres of soybeans in 1942 compared with less than 5 acres in 1932.

During the years 1933–36, hog-dairy farmers reduced their acreage of grain corn by 9 percent; this was almost offset, however, by the increase in acreage of corn for silage. In 1942 the corn acreage on these farms was 6 percent less than the record acreage in 1932, but was somewhat higher than that of recent years. The acreage in small grains has decreased slightly since 1932 on hog-dairy farms but the area in soybeans increased, although small in total, and in terms of acreage practically offset the decrease in small grain.

The acreage in hay increased slightly on hog-dairy, hog-beef raising, and hog-beef fattening farms from 1910 to 1930 and then declined for about 3 years. A few years were bad for obtaining new seedings, in the early and middle thirties, but during the last few years the hay acreage has been increasing on all the Corn Belt farms.

The decline in acreage of hay on cash-grain farms, begun after 1910, continued until about 1925. The acreage remained almost constant from 1925 until 1938, since when it has risen fairly rapidly; in 1940–42 it was 50 percent greater than in 1925–34. The acreage in hay on cash-grain farms is comparatively small as few livestock, particularly roughage-consuming animals, are kept. The reduction in hay acreage seems to parallel the reduction in numbers of work animals until recently when there has been a concerted effort toward increasing the livestock enterprises on these farms. Work animals formerly consumed well over half the hay on cash-grain farms; but with tractor farming, horses have practically disappeared on cash-grain farms. Increases in rotation pasture and hay as a result of the agricultural program forced cash-grain farmers to obtain an outlet for their roughage; more livestock was the easiest solution.

The total production and the general quality of roughages have been improved on the typical farms by the increase in alfalfa hay and rotation pastures. The trend toward greater acreages of this nutritious roughage began about 10 years ago. Even though the acreage in alfalfa may appear small when compared with the acreages in other crops, the increase in acreage is considerable and important. Yields per acre are comparatively high. Alfalfa hay now contributes almost 50 percent of the total hay production on some farms.

Increased emphasis placed on rotation pastures by typical farm operators has been a big factor in providing palatable summer pastures for livestock as well as a green-manure crop (table 3). These pastures are also influential in preventing losses of soil productivity and in increasing crop yields. Acreages in rotation pastures and green-manure crops have increased materially on each of these typical farms since the beginning of the Agricultural Adjustment Program in 1933.

CROP YIELDS

Typical Corn Belt farmers have not only handled more acres of crops and larger livestock enterprises in later years but they have also increased the yield per acre of these crops. Figure 2 gives the yields of corn and oats for the last 33 years on cash-grain and hog-beef raising farms. These two types of farms probably represent the extremes of productivity or soil fertility among typical farms.

Cash-grain farms are large with comparatively level topography and they have a high proportion of their acreage in crops—more than 80 percent of the land is cultivated. Hog-beef raising farms are somewhat smaller; the topography is considerably rougher, and less than 60 percent of the farm land is, or probably should be, cultivated.

TABLE 3.—*Proportion of cultivated land in various crops on typical Corn Belt farms*

Item	Hog-dairy		Cash-grain		Hog-beef breeding and fattening		Hog-beef raising	
	1910–14	1938–42	1910–14	1938–42	1910–14	1938–42	1910–14	1938–42
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Corn	36	37	51	41	48	43	44	36
Soybeans	0	3	0	16	0	2	0	5
Small grain	35	28	35	26	27	25	28	25
Hay	24	22	12	8	23	22	25	23
Rotation pasture and miscellaneous	5	10	2	9	2	8	3	11
Total	100	100	100	100	100	100	100	100

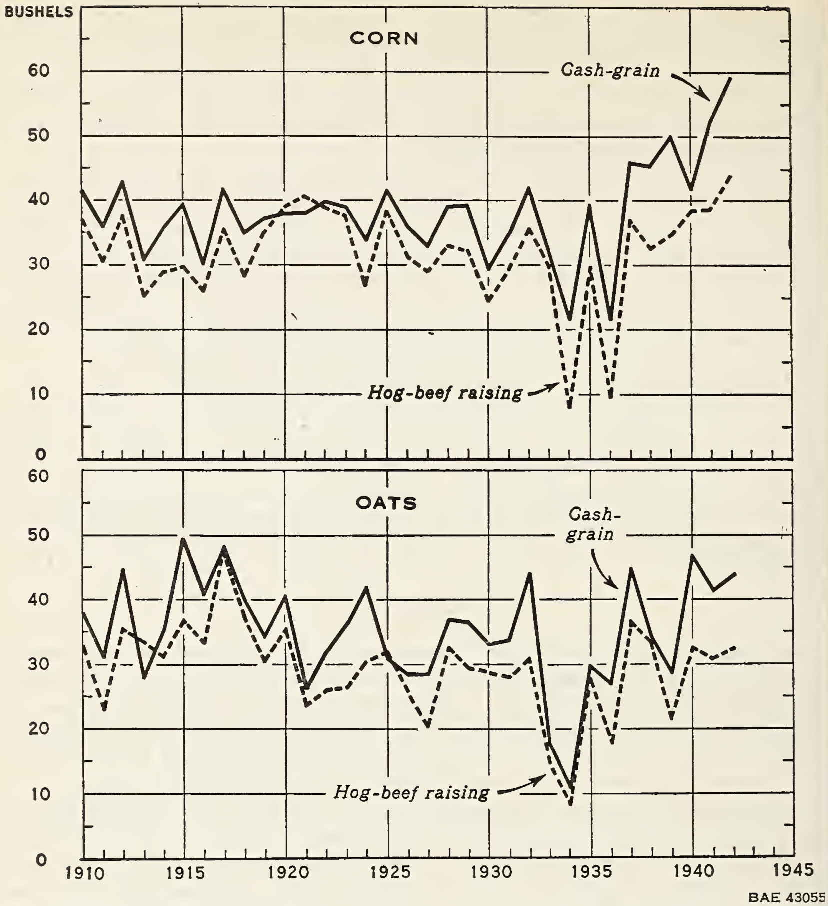

FIGURE 2.—YIELDS OF CORN AND OATS ON TYPICAL COMMERCIAL FAMILY OPERATED FARMS, CORN BELT, 1910–42.

Yields have varied considerably over the 33-year period but the last 6 years have recorded increased yields of most crops. The increase may be due to one or more of several factors, such as improved varieties, better rotations, more timely seeding and cultivating, and perhaps the use of more productive land in some crops as a result of activities of the A. A. A. and the retirement of some cultivated acreage.

There is little doubt that the increase in yields of crops has been greatest on farms where rotation pasture and green-manure crops rank high, where use of improved varieties of crops (hybrid seed corn) has been high, and where mechanized farming has been extensive. Increases in yields of corn, oats, and hay have been greatest on cash-grain farms compared with yields on other types of farms; and cash-grain farms rank highest in terms of rotation pasture, use of hybrid seed corn, and extent of mechanization.

Practically no change took place in yields of corn or oats on typical farms between the years 1910–14 and 1928–32—the 5 years before the A. A. A. began operation. (Both periods came before the extensive use of hybrid seed corn, the extensive use of the row-crop tractor and attachments, and the increase in rotation pastures and green-manure crops.) In 1938–42 corn yields were 133 percent of those of 1910–14 on cash-grain farms compared with 119 percent on hog-beef raising farms. Yields of oats in the same period were 112 percent of 1910–14 yields on cash-grain farms, and 100 percent on hog-beef raising farms.

TABLE 4.—*Corn: Acres per farm and yield per acre, typical family operated farms, Corn Belt, 1910–42*

Period	Hog-dairy		Cash-grain		Hog-beef breeding and fattening		Hog-beef raising	
	Acreage	Yield	Acreage	Yield	Acreage	Yield	Acreage	Yield
	Acres	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*	*Acres*	*Bushels*
1910–14	27.4	39.4	68.1	37.4	57.8	36.0	36.3	31.8
1915–19	28.7	33.2	71.7	36.7	58.9	36.2	37.4	31.0
1920–24	29.8	38.0	73.6	37.7	60.6	37.8	37.9	36.6
1925–29	30.8	39.6	78.9	37.8	64.9	36.5	40.2	32.8
1930–34	31.9	37.1	83.3	32.0	65.1	31.6	38.4	25.4
1935–39	31.4	43.5	80.8	40.5	62.3	34.5	35.7	28.7
1940–42	30.1	52.9	72.2	51.2	58.8	49.8	33.5	40.4

Yields of hay advanced from 1910–14 to 1928–32, but the greater yield is accounted for, to a considerable extent, by the increased proportion of alfalfa hay to the less productive types. Hay yields on cash-grain farms stood at 155 percent and 160 percent of those of 1910–14, in 1928–32 and 1938–42, respectively, compared with 119 percent and 132 percent, respectively, for hog-beef raising farms.

The fact that yields of oats, barley, and wheat increased little compared with those of corn between the period 1910–14 and 1938–42 gives some support to the theory that the big increase in corn yields must have been due to factors other than weather. This possibility is illustrated in part by the edge in corn yields that cash-grain farms have maintained over hog-beef raising farms (table 4). This margin may be the result of the more extensive adoption of hybrid seed and mechanization on the cash-grain farms. About 75 percent of the corn acreage on cash-grain farms was seeded with hybrid seed corn in 1938–42, whereas on less than 50 percent of the acreage on hog-beef raising farms was hybrid seed used. Moreover, 89 percent of typical cash-grain farmers had tractors and tractor equipment in 1938–42 in contrast to 36 percent of the hog-beef raising farmers. (The number of tractors is an index of mechanization on Corn Belt farms.)

LIVESTOCK SYSTEMS

Livestock systems on typical Corn Belt farms vary considerably among types of farms. Perhaps most exacting in terms of skilled livestock management of the types studied are the hog-dairy farms. On these farms a relatively large hog enterprise, several high-producing dairy-type cows, and a substantial acreage of feed crops are combined in a well-rounded working year that requires the best of management. At the other extreme is the cash-grain farm with a less important hog enterprise and a few mixed beef and dairy cows of which less than half are milked.

Operators of hog-beef fattening and hog-beef raising farms place considerably more emphasis on the production of beef than do cash-grain or hog-dairy operators. Only three or four cows are milked on these beef-producing farms. Operators on hog-beef raising farms have handled until recently about the same number of hogs and about twice as many cattle as cash-grain farmers. Hog-beef fattening farms have considerably more hogs and beef cattle than other farms; livestock from these farms are sold as fat animals and even though the farms are fairly large and considerable feed is produced, the operators usually buy substantial quantities of feed grain from their cash-grain neighbors.

THE CATTLE ENTERPRISE

The typical hog-dairy farmer here produces milk to be manufactured into such products as butter, cheese, condensed milk, and dry or powdered milk. In 1910–14 the typical farmer milked slightly less than 10 cows with an average production of 210 pounds of butterfat per cow. The size of the herd remained at about 10 head until 1924, when it began to decline, probably in favor of a more profitable hog-feeding program. But during this period more nutritious feeds, combined with better feeding practices and culling programs, increased the average butterfat production per cow from 210 pounds in 1910–14 to 242 pounds in 1928. The size of herd began to increase slowly after 1928, but the production per cow began to decrease and was less than 220 pounds in 1933 and 1934. In 1935–39 the typical operator milked about 11 cows with an average production of 233 pounds of butterfat per cow.

With the opening of the war in Europe more milk and more milk products were demanded. In response to this call and a somewhat more favorable feed-price ratio for dairy products, these farmers by 1942 increased their total butterfat production by 27 percent, compared with the period 1935–39. This was made up of a 16-percent increase in the size of herd and a 9-percent increase in production per cow. In 1942 these farmers milked about 13 cows with an average butterfat production of nearly 255 pounds.

These farmers usually raise their own herd replacements. Female calves for replacement are selected and retained as part of the stock herd until they are about 27 to 30 months of age, when they freshen and go into the milking herd. The culled calves are sold as vealers and the culled cows are sold for beef. Approximately 35 percent of the total herd is replacement stock on these farms (table 5).

The cattle enterprises on hog-beef fattening, hog-beef raising, and cash-grain farms are similar in that the production of beef instead of milk and milk products is emphasized and a common practice of herd maintenance is followed by all the operators. But the practice of feeding and selling varies decidedly as between types of farm. Each of these farm operators attempts to maintain his breeding herd, though it may appear small in some instances, by breeding and raising replacements. The most common practice is to breed heifers for replacement, to calve at about 3 years of age. From 15 to 20 percent of the stock cows are culled out and sold each year. The breeding herd is generally increased by either holding back some cows which normally would have been sold or by retaining more heifers for breeding purposes, or by both procedures. Replacements, except for sires, are seldom bought.

TABLE 5.—*Stock cattle on typical Corn Belt farms, 1910–42*

Period	Hog-dairy		Cash-grain		Hog-beef breeding and fattening		Hog-beef raising	
	Mature	Young	Mature	Young	Mature	Young	Mature	Young
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
1910–14	9.7	5.2	5.9	6.5	14.2	17.3	10.3	14.8
1915–19	10.3	5.5	5.9	6.5	15.2	18.5	11.8	16.9
1920–24	10.7	5.7	6.3	6.9	17.1	20.9	12.2	17.6
1925–29	10.1	5.5	6.1	6.8	16.6	20.4	10.8	15.5
1930–34	11.3	6.1	6.4	7.2	15.8	19.2	10.2	14.7
1935–39	11.6	6.2	6.8	7.5	16.5	20.2	10.2	14.8
1940–42	12.8	6.9	8.0	8.8	18.9	23.1	11.3	16.2

Operators of hog-beef fattening farms have increased materially the size of their stock herds in the last few years. The number of stock animals on farms January 1, 1910–14, averaged about 32 head (table 5). By 1933, they had increased to only 36 but by 1942 they had increased to 45 head. All the cattle sold from these farms are fat; most are sold when 1 to 2 years old. Until fairly recently, these operators bought most of the calves they put into the feed lot. Now this situation has been reversed; they raise most of the calves they fatten. The aim of the producer is to buy enough calves of the same age and description as those he raised to feed out a carload of uniform cattle. Since trucking of livestock has become so common the average shipping load has been reduced, so the cattle feeder is not obliged to buy so many calves to go with those he raises, to make a uniform load. However, this may be only one of many reasons why the typical beef feeder has been buying fewer calves for fattening. He has increased the acreage of roughage and pasture, thereby permitting him to raise more beef cattle to the fattening age. The increase in size of stock herd and the decrease in number of calves bought correspond closely in point of time with the increase in acreages of rotation pastures and hay.

The typical cattle enterprise on hog-beef raising farms consisted of about 25 head of stock animals in 1910–14. The number gradually increased and by 1924 amounted to 33 head. This was the largest inventory of cattle on these farms during the entire 33-year period. The number of stock animals began to decrease after 1924 and by 1931 had reached a new low of only 23 head. The size of the herd began to increase again after 1931 only to receive another set-back by the droughts of 1934 and 1936. These droughts were rather widespread, but were more severe in the areas where hog-beef raising farms are prevalent. Operators of hog-beef raising farms lost much of their pasture and hay seedings, and the production of forages and grains was reduced to practically nothing (fig. 2). Large inventories of breeding stock had to be sold from farms in the drought area. The last few years of good crops and recent anticipations of strong demands and good prices for livestock have brought an increase in the inventory of stock cattle on hog-beef raising farms. By 1942 the typical hog-beef raising farm had about 30 head of stock cattle; this number is considerably larger than those kept in the drought years, but is still somewhat below the number carried in 1924.

Operators of hog-beef raising farms follow the practice of breeding and raising cattle to be sold mostly as calves and yearlings, unfattened. Many of these cattle are sold directly to beef-feeder operators to be fattened before slaughter. About 26 percent of the annual calf crop is sold as calves; about 50 percent is sold as yearlings to 2-year-olds; the others are kept for breeding stock, to drop calves when about 3 years old.

Although the cattle enterprise assumes little importance compared with the crop and hog enterprises on cash-grain farms, the increase in the size of the enterprise has been pronounced. In 1910–14 the total number of cattle in the breeding herd numbered only 12 head on cash-grain farms. The size of herd increased very little between 1910 and 1935; since 1935 the increase has been marked, and by 1942 the typical cash-grain farmer had 18 head of cattle in his breeding herd.

Without doubt cash-grain farmers have felt the need of a cattle enterprise, particularly since 1935. Although they have decreased the acreage in hay, they have increased the total hay production by turning to alfalfa hay, and by increasing the average yields of hay. They have increased pastures by added emphasis to rotation pastures. Moreover, they have reduced the number of work animals through increased use of tractors. Without a roughage-consuming livestock enterprise, considerable feed would probably go to waste. For obvious reasons of farm organization and management, the beef-cattle enterprise rather than the dairy seems to be the appropriate livestock enterprise on these farms.

At the onset of the war and the call for increased production of livestock, concurrent with more favorable prices for livestock, cash-grain farmers were in an advantageous position and responded with a sizable increase in production. The average output of beef on these farms in 1941–42 exceeded the output in 1935–39 by 35 percent. Although these farmers have ample concentrate feeds for fattening cattle, they have not always sold finished cattle or fed their cattle to heavier weights; nearly half of their cattle have been sold as "short yearlings." Unless their cattle enterprises are expanded considerably, there may be a trend to longer feeding because of the increased production of roughages on these farms.

THE HOG ENTERPRISE

The hog enterprise is perhaps the most important single enterprise on typical Corn Belt farms (table 1). The general trend has been for increased production throughout the last 30 years. Hog numbers in general increased slightly on all the farms from 1910 to 1927; then they began to decline on hog-beef raising and hog-beef fattening farms and reached a new 10-year low in 1931, after which they began to increase. Hog numbers on cash-grain and hog-dairy farms, however, continued to increase after 1927 and until 1934. There appears to be a 3- to 4-year hog cycle on typical Corn Belt farms; the peak of the cycle appeared a year later on some types of farms than others.

As a result of the operations of the Agricultural Adjustment program in 1933 and 1934 and the drought of 1934, hog numbers were reduced materially on all farms. In 1935, hog numbers on all types of farms were the lowest in the entire 33-year period.

Hog numbers received another set-back by the drought of 1936, which was more severe in the areas where beef-raising and beef-fattening farms are located; its effect on the hog enterprise was far more drastic than on hog-dairy or cash-grain farms (table 6). The typical farmers have made considerable come-back with their hog enterprises since the droughts, but hog-beef raising farmers have done so only with difficulty for the drought reduced livestock numbers and feed supplies on these farms to unprecedented lows.

TABLE 6.—*Hogs on farms Jan. 1, and hundredweight of live hogs sold, typical Corn Belt farms, 1910–42* [1]

Period	Hog-dairy		Cash-grain		Hog-beef breeding and fattening		Hog-beef raising	
	Hogs per farm	Sold	Hogs per farm	Sold	Hogs per farm	Sold	Hogs per farm	Sold
	No.	*Cwt.*	*No.*	*Cwt.*	*No.*	*Cwt.*	*No.*	*Cwt.*
1910–14	34. 4	88. 1	29. 7	68. 8	49. 6	116. 9	28. 8	66. 3
1915–19	35. 2	87. 0	28. 7	66. 2	53. 5	127. 1	27. 2	62. 8
1920–24	34. 5	88. 3	28. 3	71. 1	55. 6	141. 9	31. 1	77. 8
1925–29	35. 0	98. 2	30. 4	81. 9	61. 4	172. 4	34. 5	94. 0
1930–34	39. 3	110. 2	31. 7	84. 6	58. 0	159. 0	34. 0	90. 8
1935–39	29. 9	96. 0	25. 2	81. 7	41. 8	134. 6	18. 4	56. 5
1940–42	37. 3	129. 1	32. 6	114. 0	51. 2	179. 1	24. 4	81. 6

[1] The difference between the amount of hogs sold and the amount produced averages between 550 and 750 pounds.

Since 1910 several things have minimized the importance of hog numbers on farms January 1 as an index of annual pork production. This is evident from a study of the relation between hog numbers per farm January 1 and the hundredweight of live hogs sold (table 6). From 1910 to 1920 the pounds of live hog produced per hog on the farm January 1 was about 235 pounds. This ratio began to increase after 1920 and by 1940–42 reached about 350 pounds of live hog produced per hog on farms January 1.

Several factors are probably responsible for the general increase in pork production per hog on farms January 1. There seems to be little doubt that feeding to heavier weights, number of fall farrowings, and time of marketing, have direct and immediate effect on production. In 1934 (the drought year) hogs were sold at light weights, the number of sows farrowing in the fall was reduced, and most of the hogs were sold before January. Relatively fewer pigs were carried through the winter of 1934–35. The pounds of live hog produced per hog on farms January 1, 1934, were only 220. Contrast this with 1942 when typical Corn Belt farmers responded to higher production goals. Farmers were asked to feed hogs to heavier weights and, with the added incentive of a favorable hog-corn price ratio of better than 17 to 1, produced more than 400 pounds of live hog for each hog on inventory January 1.[1] Improved sanitation, better feeding practices, more careful selection and breeding of sows, better care at farrowing time, and an increase in the number of pigs per litter have influenced the increase in the production of pork.

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[1] The hog-corn ratio stood at 19.7 to 1 in Iowa in November 1942. The ratio of the same date for 1936–40 was 14.9 to 1.

As a result of these factors, the typical farmers are producing considerably more pork than ever before. In 1942 typical hog-beef fattening farmers produced nearly 22,000 pounds of live hogs. This exceeds by 17 percent their previous record made in 1927. Hog-dairy farmers exceeded by 15 percent their previous record productions of 1939 and 1933. Although operators who raise hogs and beef fed hogs to heavier weights in 1942 than ever before, because of the reduced number of hogs (particularly breeding hogs) they were 8 percent short of their previous record production in 1927 but they have made rapid gains during the last few years.

In 1942, typical cash-grain farmers produced nearly 14,000 pounds of live hogs; nearly twice the production of 1927. This is an increase of 23 percent over the production of 1939–41 and an increase of 66 percent over their 10-year production 1920–29. This typical farm family in the Corn Belt consumes around 600 pounds of hog annually; the remainder is sold. Thus, the difference between hogs produced and hogs sold is approximately 600 pounds. Although on cash-grain farms the hog enterprise is comparatively small and is perhaps somewhat insignificant when compared with the cropping enterprises, there has been a steady growth in the hog enterprise on these farms since 1921. The major reason why the droughts of 1934 and 1936 had so little effect in reducing hog production on these farms, compared with other types, may be the relative smallness of the hog enterprise compared with the cropping enterprise on cash-grain farms. Hog production in 1934–37 compared with hog production in 1928–32 was reduced by only 15 percent on these farms compared with 41 percent for hog-beef raising farms, 31 percent for hog-beef fattening farms, and 21 percent for hog-dairy farms.

It must not be thought that cash-grain farm operators are changing from a cash-crop type of farming to livestock farming even though they have been enlarging their cattle and hog enterprises. These farm operators have been expanding crop production as well as livestock production. In 1938–42, the index of crop production stood at 188 compared with 145 for livestock production, both indices based on 1910–14=100. Of course recent crop yields, particularly corn yields, have been exceptionally good. In 1942, a bumper crop year, the index of crop production on cash-grain farms stood at 200 compared with 180 for livestock production. Nevertheless, these indices of production are evidence that these farmers are pursuing their usual pattern of farming but at considerably higher levels of production.

THE POULTRY ENTERPRISE

The poultry enterprise on typical Corn Belt farms is of minor importance compared with the cattle, hog, and crop enterprises. Less than 10 percent of the total farm income is obtained from the sale of poultry and poultry products. This does not mean, however, that the poultry enterprise is not important on these farms. These typical-farm poultry enterprises are important in that they contribute to a well-rounded combination of farm enterprises. In addition, they contribute greatly to the Nation's supply of poultry and poultry products for about 90 percent of its supply comes from just such farms scattered in farming areas all over the country.

The poultry enterprise seems to fit well into most types of Corn Belt farming and particularly well into hog-dairy farming. Hog-dairy farms have slightly larger flocks than the other types although they were not larger until recent years. From 1910 to 1918 the typical laying flock on hog-dairy farms consisted of about 100 layers; the number in the flock began to increase in 1918 and continued until 1930; then it began a decline which continued until 1934. Then production leveled off and remained practically unchanged until 1938. During the period 1934–38 the average number of layers in the flock was just about at the 1918 level. Since 1938, the number of layers has sharply increased; by 1942 the typical farm flock on hog-dairy farms numbered nearly 130.

During the last few years the typical hog-dairy farmer has sold annually nearly 900 dozen eggs and 600 pounds of poultry. In 1942, these farmers sold an average of nearly 1,000 dozen eggs at an average price of nearly 30 cents per dozen.

Hog-beef fattening and cash-grain farmers each had about 110 layers in the flock during the period 1910–18. Hog-beef raising farmers had slightly more than 100 during this period. The size of flock was increased slightly on all these farms during the years 1918–24 and remained at the 1924 level until 1929. During the depression the size of flock reached a new low on these 3 types of farms. Layers were reduced to 85 birds on hog-beef raising farms; by 1942 the number of layers had increased on all these farms, but was still below the number in the late 1920's.

Apparently typical Corn Belt farmers are now managing the poultry enterprise better than formerly. During the period 1910–14 hog-dairy farmers were getting about 90 eggs per year from each layer. This level was continued with little interruption until about 1931 when it began to rise; in 1942 the average was 110 eggs per layer.

During the period 1931–42 the average egg production was 100 eggs per layer or an increase of 10 percent over the average production in 1910–14. The average egg production on hog-dairy farms was generally about 10 percent higher than on hog-beef fattening, hog-beef raising, or cash-grain farms.

THE SHEEP ENTERPRISE

The sheep enterprise consists of a small farm flock on typical Corn Belt farms, but some farms have no sheep. The typical cash-grain farm has no sheep, whereas the typical hog-beef raising farm now maintains about 15 breeding ewes.

Though the sheep enterprise may be still considered of minor importance on the typical farms, the size of the enterprise has increased considerably. Moreover, the efficiency with which the enterprise is handled has evidently increased materially within the course of 30 years. The number of breeding ewes in the typical farm flock has doubled since 1910–14 and the output has tripled. In 1910–14 the typical hog-beef raising operator produced only 42 pounds of sheep and lamb for each animal in the breeding herd compared with 68 pounds in 1938–42 (an increase of 62 percent). During this period hog-dairy and hog-beef fattening farmers increased this ratio from 33 pounds and 52 pounds to 53 pounds and 77 pounds, respectively. The wool clip increased from 7.3 pounds per animal in 1910–14 to about 7.7 pounds in 1938–42. Less than 4 percent of the total farm income is obtained from the sheep enterprise.

Efficiencies in Managing Livestock

Typical Corn Belt farmers have learned through years of experience to combine and manage their crop and livestock enterprises with growing efficiency. Some of the efficiencies, particularly in regard to livestock, may mean more than is apparent at the moment because the final and important results appear in other sections of the farm business. A good example of this is found in the feeding programs of the typical farmers during these 30 years.

From 1910 to 1920 the typical farmer fed about 520 pounds of grain for each 100 pounds of live hog produced. By 1940 the quantity required to produce 100 pounds of hog had been reduced to 490 pounds, a reduction of 30 pounds of feed for each 100 pounds of hog produced. Two possible reasons for this increased efficiency come immediately to mind. Perhaps hogs are now more efficient feed converters than they were 25 years ago and perhaps farmers are now more proficient in feeding hogs. Probably both of these assumptions have considerable validity, but after giving thought to the problem and inspecting the experiences of these farmers in other livestock enterprises, one is inclined to think that other rather remote or indirect factors are largely responsible.

Compare the experiences of the same farmers with the dairy enterprise during the last 25 years. The typical hog-dairy farmer is now feeding each cow about 19 percent more feed than he was 25 years ago but he is getting about 19 percent more milk. In other words, he has been feeding according to production and there has been no significant reduction in feed requirements per unit of milk produced. Farmers have had similar experiences with the beef-fattening and poultry-laying enterprises.

It hardly seems reasonable to suppose that most of the improvement in feed-conversion efficiency has been made in the hog enterprise and little in the dairy enterprise. (Of course, dairy cows have been improved; the average dairy cow of today has far greater capacity to convert feed into milk than the cow of 30 years ago.) It appears from these experiences that considerable credit for the increase in pork production per unit of feed may be accounted for by better management, including improved sanitation practices and disease-control measures which have reduced the mortality among pigs; better care of sows at farrowing time thereby saving more pigs and increasing the ratio of growing pigs to breeding herd; and improved breeding practices and better selection of sows to obtain larger litters.

Myriads of factors must be kept in mind by the typical Corn Belt farmer when he is organizing and operating his farm business. Some of these may appear as mere details with little significance, but when they are combined they may permit the effective operation of a large and efficient business which yields satisfactory returns throughout the years. The typical farmer has definitely increased the effectiveness of his feed and labor. He now produces more livestock with less feed than formerly; this is true in all livestock enterprises on typical farms. His more efficient application of labor now produces more crops and livestock per unit of labor. These efficiencies show up in the increased incomes to farm operators.

Farm Adjustments, Income, and Expense

Several factors have apparently influenced the income and economic well-being of operators and families on typical Corn Belt farms. They include the various adjustments in size of farm, acres in crops, and numbers of livestock; the increased use of mechanical equipment, hybrid seed corn, and green-manure crops; and the general increase in efficiency with which typical Corn Belt farms are operated. The index of net farm income for the typical farms has now been well above 100 percent of the 1910–14 base, for 8 years. It has been below 100 in only 4 years during the last 20 years (fig. 3). The income and adjustments on these farms throughout the years, however, have differed significantly from one another.

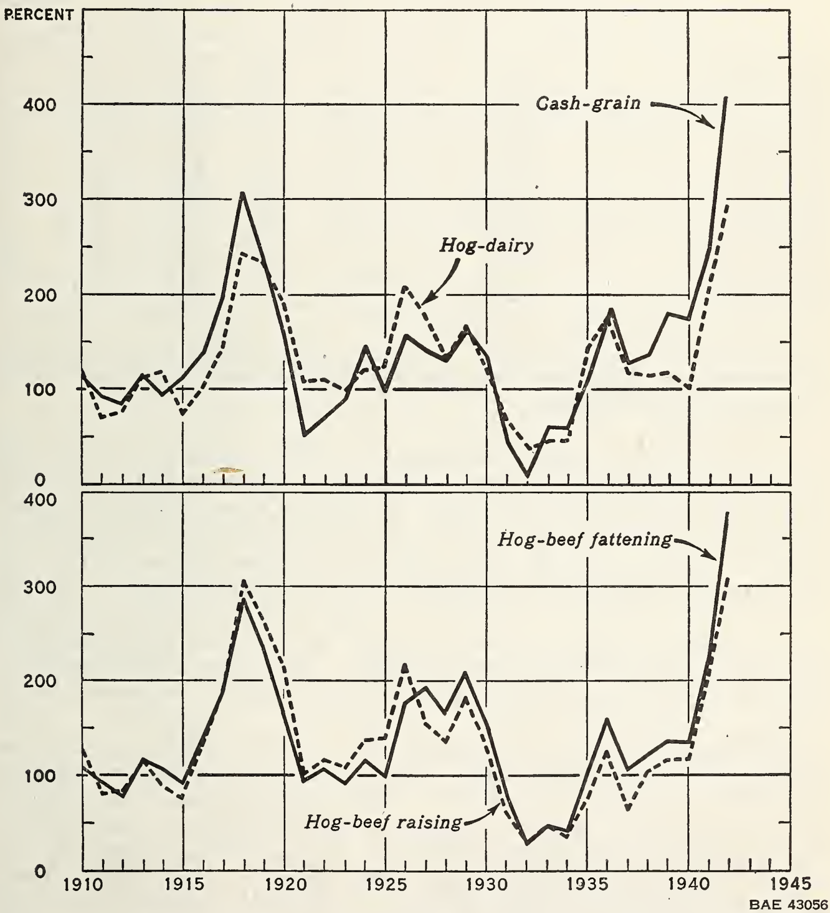

Figure 3—Index Numbers of Net Farm Income, Typical Commercial Family Operated Farms, Corn Belt, 1910–42 (1910-14=100)

CASH-GRAIN FARMS

Perhaps the greatest adjustment in farm organization and change in income has occurred on cash-grain farms. Table 7 gives in summary form some of the changes that have taken place since 1910–14 on typical cash-grain farms. From it and from figure 3 it is readily seen that many significant changes have occurred on these farms and that the changes have been irregular. Perhaps from the viewpoint of their influence on the operation of these farms and on the incomes received by the operators the most significant changes may be classified into four groups: (1) Increase in size and output of farm, (2) shift in emphasis of production, (3) changes in technology, and (4) increase in efficiency and reduction in labor.

TABLE 7.—*Information on typical cash-grain farms, Corn Belt*

Item	Unit	1910–14	1928–32	1938–42	Change from 1910–14 to 1938–42
					Percent
Land in farms	Acre	168	197	219	30
Land cultivated	Acre	134	166	182	36
Corn	Acre	68.1	84.5	74.5	9
Corn yield per acre	Bushel	37.4	37.0	49.8	33
Soybeans	Acre	0	4.0	29.5	----------
Small grain	Acre	47.4	63.2	46.9	0
Grain sold	Bushel	2,405	3,070	4,028	67
Cattle sold	Pound	2,686	2,578	3,352	25
Hogs sold	Pound	6,884	8,450	10,720	56
Poultry sold	Pound	465	575	507	9
Butterfat sold	Pound	367	559	643	75
Eggs sold	Dozen	576	732	757	31
Net farm income [1]	Dollar	1,220	1,173	2,781	128
Income from crops [2]	Percent of total income	57.1	55.9	60.6	6
Hired labor	Day	76.6	91.8	51.6	−33
Farms with tractors	Percent	0	50	89	----------

[1] Net farm income as used here is the amount of money received during the calendar year by operator and unpaid members of his family for services rendered on the farm and for farmer's own investment but not including value of commodities used for human consumption on farms where grown.

[2] Excluding Government payments.

In 1910–14, the typical cash-grain farm consisted of about 168 acres of which 80 percent was cultivated. Considerably more than half of the cropland was in corn. The size of farm slowly but gradually increased from 1910 to 1930 when the typical farm consisted of about 190 acres of which approximately 80 acres were in corn. Approximately 80 percent of the farm land was still cultivated. By 1930 the combined effects of several factors began to have a definite and pronounced influence that permitted the typical operator to handle more land and other resources more skillfully. The size of farm began to increase rather rapidly after 1930 and by 1942 had increased by 35 acres.

By 1938–42 the typical cash-grain farm was about 30 percent larger than in 1910–14 and the total output was about 80 percent greater. Improved varieties of seeds and better farming practices had increased yields of corn by 33 percent, of oats by 10 percent, and of hay by 60 percent over yields in 1910–14. Both livestock numbers and output per unit of livestock had been increased significantly from 1910–14 to 1938–42 on these farms. In 1942 the combined index of production of crops, livestock, and livestock products stood at 187 percent of 1910–14. The index of crop production alone stood at 200 in 1942.

In spite of the big increase in the hay, pasture, green-manure crops, and livestock enterprises on cash-grain farms, even greater emphasis had been given to the production of cash crops. From 1910 to 1942 the size of livestock enterprises increased steadily. In 1910–14 the typical cash-grain farmer sold about $704 worth of livestock and $198 worth of livestock products, compared with about $1,298 worth of livestock and $339 worth of livestock products during 1938–42. However, the same farmer sold $1,200 worth of grain in 1910–14 compared with $2,513 worth of grain in 1938–42. In other words, the gross income from cash-grain had been increased by 109 percent from 1910–14 to 1938–42 compared with 84 percent for livestock and 71 percent for livestock products during the same period. In 1938–42, the combined index of production of livestock and livestock products stood at 147 compared with 188 for the index of cash-grain production—both indices based on 1910–14 as 100.

The typical cash-grain farmer had not only placed increased emphasis on cash crops but had also shifted to better paying crops. Although the oats crop has played an important part in Corn Belt farming, it has not been considered a high-value cash crop. The acreage of oats in 1938–42 was only 93 percent of the acreage in 1910–14 even though the acres of cultivated land per farm had increased 36 percent. The cash-grain farmer has shifted from oats to soybeans. On these farms in 1910–14 no soybeans were produced; in 1928–32 approximately 4 acres were grown on each, but 10 years later (1938–42) they had 29.5 acres each. In 1942 this typical farm had 40 acres of soybeans. The gross income in 1942 per acre of soybeans was $36.90 compared with $19.75 per acre for oats.

Because this typical farm is comparatively large with a high proportion in cultivation and a large acreage in intertilled crops, the operator has been in a relatively favorable position to take advantage of technological developments. Twentieth century technological developments that have been adaptable to Corn Belt farming generally include the row-crop tractor and attachments, the combine, pick-up baler, corn picker, the milking machine, and hybrid seed corn. The typical cash-grain farmer has too few milk cows to make advantageous use of milking machines but he has made very good use of other mechanical equipment and hybrid seed corn. In 1938–42 about 75 percent of the corn acreage on cash-grain farms was planted with hybrid seed corn; by 1942 more than 90 percent of the corn acreage was planted with it.

As most of the mechanical equipment used in the Corn Belt is used in connection with tractors, the use of tractors should give a fairly good index of use made of corn pickers, combines, pick-up balers, and tractor attachments. In 1910–14 there were no tractors on cash-grain farms. Few had tractors by 1920, but by 1930 approximately 50 percent had tractors and by 1940 more than 90 percent of these farms were operated with tractors.

The extensive adoption of these technological developments has meant a material decrease in man-labor requirements per unit of product, and in total it has meant less labor, particularly hired labor, to handle even larger farm enterprises. The appropriate use of mechanical equipment has meant a two-way reduction in farm-labor requirements: It has reduced the quantity of labor required per unit of product (table 8), and by reducing materially the labor requirements on certain crops, it has reduced the peak labor load which usually occurs in the summer and which has been a definite deterrent to increasing many farm enterprises. To a certain extent the use of technological developments permitting the farmer to perform certain field operations in less time has allowed him more latitude in the use of his labor. In reality, it has meant a change in seasonal distribution of labor.

In 1910–14 slightly more than 4,500 hours of man labor were used in the production of crops and livestock on cash-grain farms. Approximately 83 percent of this labor was supplied by the operator and his family. Nearly 60 percent of the total labor was spent in April, May, June, July, and November. About 77 days of labor were hired, practically all of which came in these 5 months. On these farms in spite of the relatively large increase in crops (the labor requirements for which come mostly in summer) the operators reduced and spread the labor load by more effective farm management and by mechanizing their farms. In 1938–42 only 53 percent of the work came in the 5 months—April, May, June, July, and November—with the largest reductions coming in July and November, the months in which hired labor was formerly high. Furthermore, the operator, with a smaller family labor supply than he had in 1910–14, was able to do in 1938–42 nearly 90 percent of the total farm work.

TABLE 8.—*Man labor utilized in the production of crops and livestock, typical cash-grain farms in the Corn Belt, 1910–14 and 1938–42*

Item	Unit	1910–14	1938–42
		Hours	*Hours*
Corn	Acre	19.5	10.3
Oats	Acre	10.9	6.3
Wheat	Acre	13.4	7.1
Soybeans	Acre		7.0
Hay, mixed	Acre	11.0	8.0
Milk cows	Number	108.0	114.0
Stock cattle	Number	25.0	25.0
Hogs	Hundredweight	3.7	3.3
Laying hens	100 birds	160.0	160.0

This increase in efficient management seems almost phenomenal in view of the fact that total production in 1938–42 was increased by 87 percent over that of 1910–14, with a decrease of 33 percent in days of hired labor.

The question naturally arises as to whether the reduction in labor expense has not been offset by increased expense for power, machinery, and equipment, because the increased use of these items is partly responsible for this reduction in labor. This offset apparently has not occurred on these farms, particularly if output is considered. The total expenditures for labor, machinery, and power (including horse costs except chore labor for horses) reached $804 in 1910–14. The same bill for 1938–42 amounted to $684. This comparison may be somewhat misleading because of the relative amounts of each of the items in the total and because rates of wages and prices of machinery, equipment, and supplies were higher in 1938–42 than in 1910–14. In 1938–42 the combined quantity index for power, machinery, items for work animals, and labor was 81 compared with 100 for 1910–14. During the period 1938–42 the quantity index of items for work animals was 23, the index of amount of hired labor was 68, and the quantity index for power and machinery was 147, all based on 1910–14 as 100.[2]

The typical cash-grain farmer has kept his farm expenditures pretty well under control in spite of rising prices and increased production (fig. 5). In 1910–14, the cash-grain farmer spent $882 to operate his business; in 1938–42 he spent $1,699, or about 93 percent more than in 1910–14. From 1910–14 to 1938–42, however, the prices he paid for goods and services had risen by 58 percent. The index of quantity of goods and services he purchased for use in production had risen 43 percent from 1910–14 to 1938–42, but the index of output had increased 69 percent during this period. The ratio of total income to total expense was 2.38 in 1910–14 compared with 2.64 in 1938–42.

These various shifts and adjustments in farm organization and management seem to have given good results. Most of the adjustments began to take form in the late 1920's. The Agricultural Adjustment Program which began in 1933 gave further impetus. In 1910–14 (the parity base period) the typical cash-grain farmer made a net income of a little more than $1,200. Increased demand and higher prices as a result of World War I, together with some expansion, brought the net farm income up to almost $3,800 in 1918. The severe depression reduced his income to slightly more than $100 in 1932. Continued expansion and adjustment which began in the early 1930's, together with somewhat stronger prices in 1938–42, brought the net farm income of this typical operator to nearly $2,800 in 1938–42. The highest income on record for these farmers was received in 1942—approximately $5,000.

HOG-BEEF BREEDING AND FATTENING FARMS

Hog-beef breeding and fattening farms are much like cash-grain farms in that they are comparatively large. They are usually located on soil that is by nature rather productive, and fairly large acreages of grains, particularly corn, are grown. Also like cash-grain farms, they are large enough and grow a large enough acreage of intertilled crops to make fairly effective use of mechanical equipment. They differ materially from cash-grain farms in that feed grains are generally bought instead of sold, and rather large livestock enterprises are kept on them.

Because operators of hog-beef fattening farms have made two or three shifts of considerable magnitude, it is difficult to express the actual growth or change in output on their farms. In 1910–14 they bought 52 percent of the steers and heifers that they fed out. They have gradually increased the home herd and bought fewer feeder cattle. In 1938–42 they were buying only 28 percent of the steers and heifers they fed. In 1910–14 they were buying considerable feed for their hogs and to fatten their cattle. In 1938–42 they were growing practically all their feed. Moreover, they had increased their hog enterprises materially since 1910; by 1938–42 they were producing approximately 50 percent more pork than in 1910–14.

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[2] In 1910–14 the average number of work animals was 7.4 compared with 2.0 for 1938–42, or 27 percent as many work animals in 1938–42 as in 1910–14.

These farms show a definite upward trend in acreage, numbers of livestock, and production since 1910. Although certain shifts in enterprises were taking place, the general upward trend—particularly in some crops and in some types of livestock—was broken by the recent depression, the droughts of 1934 and 1936, and the Agricultural Adjustment program which began in 1933. During the 5 years 1928–32 the land in corn, oats, and hay on these farms averaged approximately 67 acres, 28 acres, and 26 acres, respectively. In 1934 the acreage was 55, 19, and 24. Although the number of cattle in the farm herd was on the declining phase of the cattle cycle from 1923 to 1931, they were well on the increase by 1934 only to receive a serious set-back by the droughts of 1934 and 1936. In 1937, the typical beef-breeding herd consisted of only 33 head; this was about 7 head below the previous 3 years and the same as in 1931, when the number was the low for the 10 previous years. Hog numbers were reduced nearly 10 percent from 1928–32 to 1934 and were the lowest on record in 1935; in 1935 they were only 61 percent of the number in 1928–32.

Considerable adjustment has taken place on these farms since the occurrence of the depression, drought, and the initiation of the Agricultural Adjustment Program. Although acreages of corn and oats are not so large as during the years before the Agricultural Adjustment Program of 1928–32, acreages of barley, soybeans, hay, and rotation pasture are up. The trend in livestock numbers has definitely been up for several years. In 1938–42 hay production was up 14 percent over that of 1928–32 (in spite of a bumper yield and hay crop in 1929), and was 27 percent greater than in 1910–14. Pasture acreage was 20 percent greater in 1938–42 than in 1928–32. This increase in hay and pasture is perhaps one of the chief reasons why operators of hog-beef fattening farms are now raising practically all of the cattle they fatten.

Many of these farms are fairly well mechanized, but many are in transition and have many adjustments to make before the most effective results from mechanization will be attained. Although nearly 80 percent of these farmers have tractors, they still do some work with draft animals and horse-drawn equipment. In 1938–42 the typical hog-beef fattening farm had four work animals.

The big reductions in labor have come where effective mechanization has been used. They have come mostly in crop enterprises (table 8). Because these farmers have not yet made the most effective use of mechanical power and power equipment and because much of their emphasis is on the livestock, where reductions in labor have not been large, they have not reduced hired labor to the same extent as their neighbors on cash-grain farms.

In 1910–14 approximately 5,000 hours of man labor were required to operate the typical hog-beef fattening farm. In 1938–42 it required approximately the same number of hours to operate, but the size of farm in terms of acres was 18 percent greater and total production was about 27 percent larger. In spite of this increased production and an 8.3 percent decrease in available family labor, the typical operator hired only 25 percent more labor in 1938–42 than in 1910–14 (table 9). In 1910–14, the total expenditure for labor, power, and machinery (including costs incurred in keeping horses) amounted to approximately $778 compared with an expenditure of $883 for similar items in 1938–42. Much of this increase was due to a rise in prices from 1910–14 to 1938–42. The quantity index for labor, power, machinery, and horses was only 1 percent greater in 1938–42 than in 1910–14.

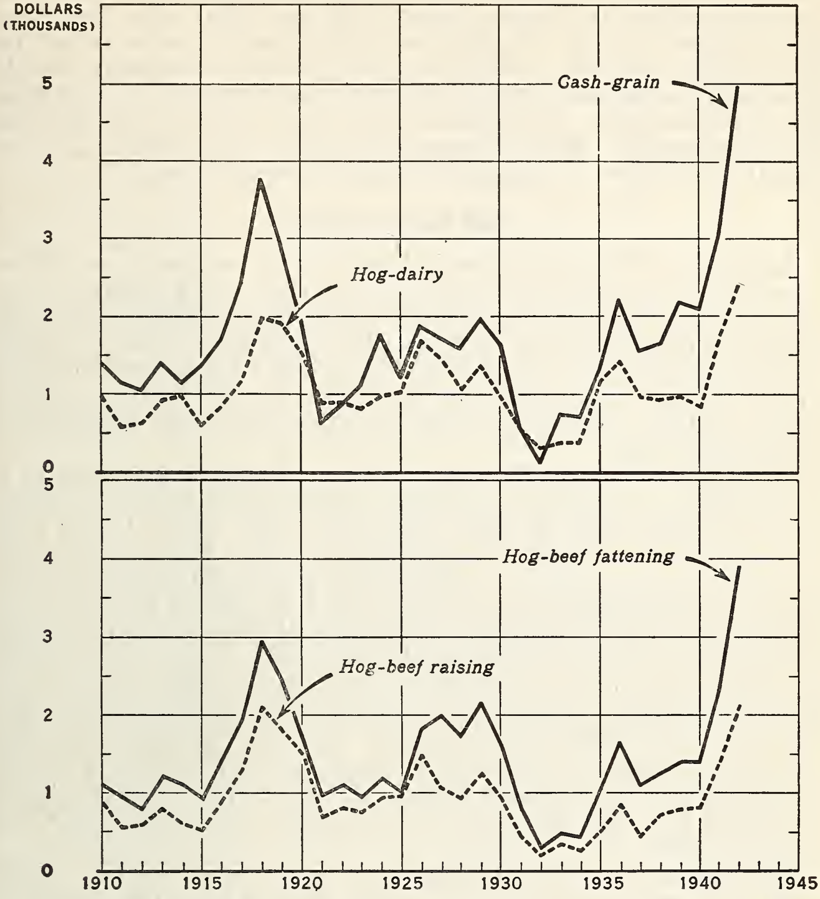

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FIGURE 4.—NET FARM INCOME OF TYPICAL COMMERCIAL FAMILY OPERATED FARMS, CORN BELT, 1910-42.

TABLE 9.—*Information on typical hog-beef fattening farms, Corn Belt*

Item	Unit	1910–14	1928–32	1938–42
Land in farm	Acre	168	186	199
Land cultivated	Acre	119	133	137
Corn	Acre	57.8	66.8	59.5
Corn yield per acre	Bushel	36.0	36.7	46.0
Small grain	Acre	31.9	36.4	37.3
Cattle sold, net	Pound	14,450	13,254	14,872
Hogs sold	Pound	11,694	17,168	17,452
Poultry sold	Pound	461	584	529
Butterfat sold	Pound	329	374	423
Eggs sold	Dozen	597	765	786
Net farm income	Dollar	1,035	1,320	2,053
Hired labor	Day	102	131	128
Farms with tractor	Percent	0	36	75

Shifts and adjustments made by these farmers in their farm enterprises appear to have yielded favorable results (figs. 3, 4, and 5). In 1910–14 (the present parity base) they averaged slightly more than $1,000 in net farm income. Their annual net income remained well above this figure in all but 2 years (1921 and 1923) until 1931; then the depression set in. From 1931 to 1934, their average annual net farm income was $500. However, through their adjustments, and the stronger demand and increased prices for farm products during these last few years, their incomes have risen fairly rapidly from the years of the depression. Their average net farm income in 1942 was nearly $4,000, or 277 percent above their 1910–14 average income.

HOG-DAIRY FARMS

Hog-dairy farms have changed very little in size since 1910 as measured by total acres or crop acres per farm. But these farm operators concentrate on the production of livestock and livestock products; well over half of the labor spent on these farms is used directly in this production and about 90 percent of the total income is derived from their sale. More than 30 percent is derived from the sale of dairy products. Hog-dairy farmers usually buy small quantities of farm-grown feeds.

Although the acreage in crops would not indicate much change in size of farm or increase in production, a significant increase in production has come about on hog-dairy farms since 1910. It has come through a shift in crops and an increase in yields. The acreage in corn was only 3 acres greater in 1938–42 than in 1910–14, and was less by 1.8 acres than in 1928–32. The decrease since 1928–32 has been more than offset by the increased acreage in soybeans. In spite of this shift, corn production was 47 percent greater in 1938–42 than in 1910–14, and 26 percent greater than in 1928–32. Corn yields on these farms averaged 52 bushels per acre in 1938-42—an increase in yields of more than 32 percent over 1910–14 and 1928–32. The total acreage in hay has not changed materially throughout the 33-year period, but the acreage of alfalfa hay has increased relative to other hays. The big increase in alfalfa has come since 1930. An increase in rotation pasture has also occurred.

In 1938–42 these typical farmers produced approximately 605,000 pounds of grain. This was 37 percent greater than the production of 1910–14 and 17 percent greater than that of 1928–32. Hay production was more than 37 percent greater in 1938–42 than in 1910–14 or 1928–32. Silage production was 179 percent greater in 1938–42 than in 1910–14 and 24 percent greater than in 1928–32.

Typical hog-dairy farmers have also materially increased their livestock enterprises (table 10). Livestock and crop production has been kept pretty well in balance on these farms. Hog production was approximately 39 percent greater in 1938–42 than in 1910–14 and 14 percent greater than in 1928–32. In 1942 these operators produced approximately 15,000 pounds of hogs, which was the record production for these farmers. It exceeded their lowest production, in 1935, by almost 80 percent.

The typical hog-dairy farmer has increased his dairy enterprise along with his increase in hay, pasture, and silage. He is now handling more dairy cows and apparently doing a better job. The typical

TABLE 10.—*Information on typical hog-dairy farms, Corn Belt*

Item	Unit	1910–14	1928–32	1938–42
Land in farm	Acre	120	130	135
Land cultivated	Acre	77	89	89
Corn	Acre	27.4	32.3	30.5
Corn yield per acre	Bushel	39.4	38.8	52.0
Small grain	Acre	27.3	28.2	28.2
Cattle sold	Pound	2,586	2,508	3,058
Hogs sold	Pound	8,806	10,744	12,240
Poultry sold	Pound	502	560	525
Butterfat sold	Pound	1,733	2,189	2,682
Eggs sold	Dozen	649	799	849
Cows milked	Number	9.3	10.3	11.9
Production per cow, butterfat	Pound	209	233	243
Net farm income	Dollar	814	856	1,377
Hired labor	Day	62	98	139
Farms with tractor	Percent	0	26	54

dairy herd in 1910–14 consisted of 9 to 10 cows with an average production of about 210 pounds of butterfat per cow. The average number of dairy cows in the typical herd and the production per cow were gradually increased. In 1938–42, this typical farmer milked from 12 to 13 cows and had an average production of 243 pounds of butterfat per cow. When the call came for increased milk production in 1942, these farmers responded with a production of 85,700 pounds of milk or approximately 3,300 pounds of butterfat—an increase of 25 percent over 1937–39. To do this they added an average of 1.7 cows and fed for higher production. Production per cow was 9 percent higher in 1942 than in 1937–39.

The typical hog-dairy farm required about 4,600 hours of man labor to operate. In 1910–14 it was so organized as to give the operator and his family rather full employment during the winter. This meant that during cropping seasons some labor had to be hired to take care of peak loads. Even then, the operator and family did 87 percent of the farm work because the operator combined his enterprises in such proportions that the labor was well distributed throughout the year.

The major increases, outside of crop yields on hog-dairy farms, have been in the hog and dairy enterprises. (Increases in crop yields do not increase materially the labor requirements per acre of crops.) Any increases in these livestock enterprises have meant an increase in winter labor which is virtually all family labor. Even back in the years from 1910 to 1930, before any material expansion occurred in the hog and dairy enterprises, family labor was fairly well utilized, and the added difficulty in meeting increased labor requirements was the fact that hog-dairy farm operators have not been able to make the most effective use of mechanization. (In 1938–42 only slightly more than half of them had tractors.) This has meant little decline in labor requirements on crops. As a result of these labor pinches (because they had increased the size of their livestock enterprises), by 1938–42 typical hog-dairy farmers were hiring some labor in nearly every month of the year. The family could do only 73 percent of the work compared with 87 percent in 1910–14. The amount of hired labor was increased significantly. Typical hog-dairy farmers were hiring about 140 man days of labor in 1938–42 compared with about 62 days in 1910–14, showing an increase of nearly 125 percent.

In spite of rather substantial increases in production, particularly of dairy products and hogs, and increased expenditures for hired labor, the typical hog-dairy farmer has kept his expenditures well under control (fig. 5). In 1938–42 the index of farm production was 146, based on 1910–14 as 100. On the same base, the quantity index of expenditures for production during this period (1938–42) was 150. Expenditures for labor and supplies were increased relative to ex-

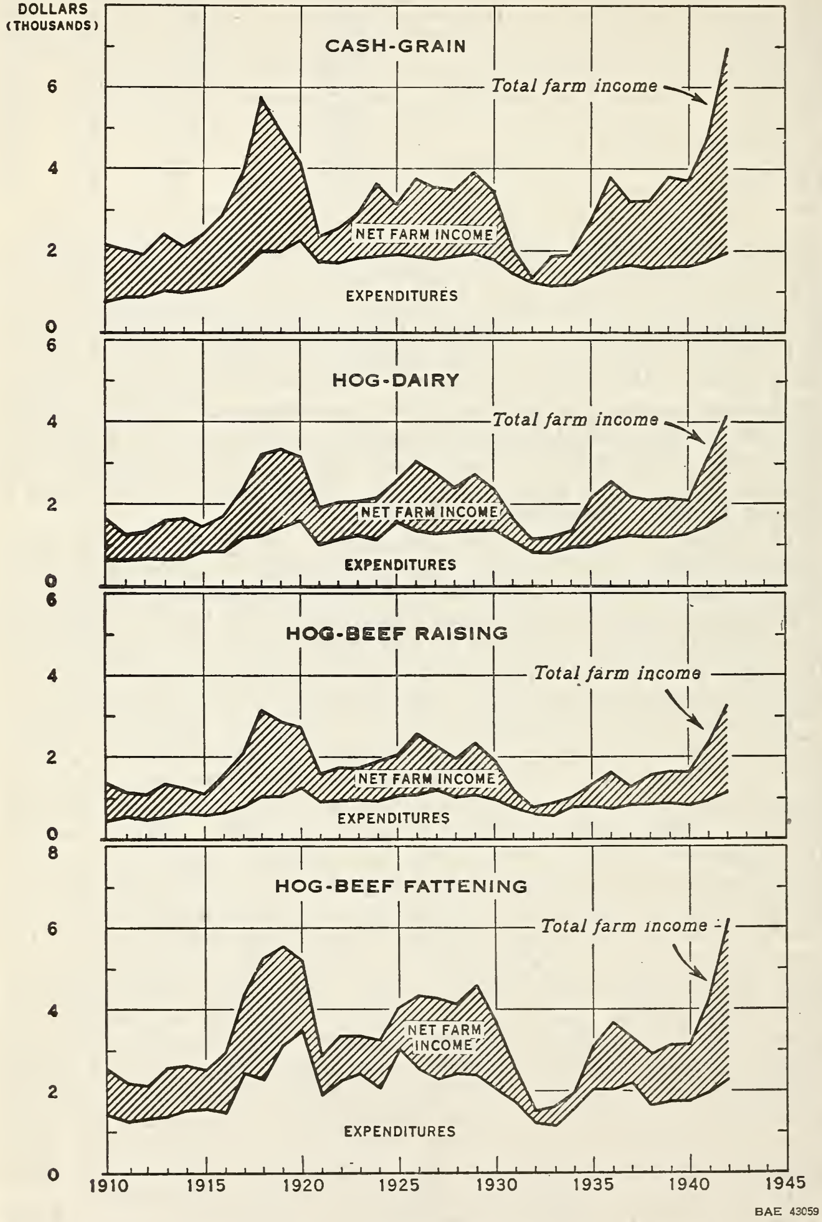

FIGURE 5.—FARM INCOME, TOTAL FARM EXPENSE, AND NET FARM INCOME OF TYPICAL COMMERCIAL FAMILY OPERATED FARMS, CORN BELT, 1910-42.

penditures for feeds, livestock, and power and machinery. Total farm expenditures in 1938–42 were 105 percent higher than in 1910–14, but much of this can be attributed to the higher prices that farmers paid for items bought in 1938–42. The index of prices these farmers paid for goods and services used in production stood at 146 in 1938–42 compared with 100 for 1910–14. As a result of the various adjustments made by these farmers, their incomes have been up in recent years. Their net farm income in 1942 was nearly $2,500.

HOG-BEEF RAISING FARMS

Hog-dairy, cash-grain and hog-beef breeding and fattening farms have practically no similarity in their major characteristics. They differ materially. Hog-beef raising farms, on the other hand, have some characteristics similar to each of the other types but they also have some significant differences. They are similar to hog-dairy farms in that they are small, have a comparatively small acreage in crops, have very little mechanization, and milk a relatively large number of cows. They differ from hog-dairy farms in that they sell feeds and beef, and milk a beef-and-milk type of animal. They are like cash-grain farms in that they sell feeds, but they differ in that they are much smaller, produce practically no soybeans, plant little hybrid seed corn, and have very little mechanization. They are similar to hog-beef fattening farms in that they both produce beef and hogs and breed and raise most of their beef; they differ in that hog-beef breeding farms are much larger and their operators milk very few cows, buy feeds and fatten their cattle. For 30 years hog-beef raising farm operators have had different problems and have followed a different course from operators of the other farms.

These operators have not shifted their emphasis of production from any one enterprise to another. The general trend in their size of farm and total production has been up but there has been no noticeable shift among crop and livestock enterprises. The index of total farm production in 1938–42 stood at 124 percent of 1910–14; in 1928–32 it stood at 114.

These operators suffered some serious set-backs as a result of the droughts of 1934 and 1936. In 1934 the production of crops was as follows: Corn 248 bushels, oats 96 bushels, and hay only 15 tons, with a reduction of pasture production and acreage of new seedings. This production represents about 19 percent of normal grain production and 65 percent of normal hay production on these farms. Production in 1936 was only slightly better. As a result, these farmers were forced to liquidate their livestock enterprises. Hog numbers in 1935, 1936, and 1937 were less than half of normal and sheep, cattle, and poultry numbers were also reduced. Milk cows were fed less and production was off. Liquidation of livestock in the drought years of 1934 and 1936 was so severe that the index of livestock production in 1935 and 1937, immediately following the droughts, stood at 79 compared with 100 for 1910-14. The index of livestock production was only 113 for 1938–42 compared with 122 for 1928–32 and 100 for 1910–14. Crop sales in 1938–42 were considerably above normal because there were fewer livestock to feed. These farmers have been striving to overcome these set-backs, and build up their livestock enterprises. The index of livestock production stood at 117 in 1941 and 135 in 1942, based on 1910–14 as 100.

Total expenditures on these farms usually run less than $1,000 (fig. 5). No particular item looms large. Taxes are the largest single item of expense and generally run about 13 percent of total farm expenditures. The total amount of labor required to operate the typical hog-beef raising farm runs less than 4,000 hours; the family performs more than 92 percent of this work, so expenditure for hiring is not a major item. The combination of labor, power, and machinery comprises the largest group of expenditures, but the operators have apparently kept expenses fairly well under control in spite of serious reverses in production. The combined quantity index of power, labor, and machinery (exclusive of feed for work animals) amounted to 122 in 1938–42 compared with an index of production of 124 in the same period, both indices based on 1910–14 as 100. Draft animals are still the major source of drawbar power on these farms; only 36 percent of these operators had tractors in 1938–42 (table 11).

The net farm income on these farms, although low compared with incomes of cash-grain, hog-beef fattening, and hog-dairy farms, has increased more recently (table 11). The average net farm income of these farmers was slightly more than $2,000 in 1942. This was their highest income on record and exceeded the income of 1941 by nearly $700 and the income of 1932 by $1,900.

TABLE 11.—*Information on typical hog-beef raising farms, Corn Belt*

Item	Unit	1910–14	1928–32	1938–42
Land in farm	Acre	145	155	170
Land cultivated	Acre	82	94	96
Corn	Acre	36. 3	40. 5	34. 0
Corn yield per acre	Bushel	31. 8	30. 9	37. 7
Small grain	Acre	22. 8	26. 4	28. 5
Cattle sold	Pound	5, 712	5, 264	5, 650
Hogs sold	Pound	6, 632	9, 346	7, 662
Poultry sold	Pound	439	521	457
Butterfat sold	Pound	515	565	623
Eggs sold	Dozen	566	686	654
Net farm income	Dollar	687	750	1, 169
Hired labor	Day	26	43	38
Farms with tractor	Percent	0	18	36

Farm Operator's Return for Labor and Management and Annual Earnings of Factory Workers

Net farm incomes of typical family operated farms in the Corn Belt may appear high or low to other farm and to nonfarm people. Some farms in the Corn Belt yield higher incomes and some yield lower incomes than these typical farms. But there are hundreds just like these. They yield about the same return and give their operators about the same opportunity.

How does the typical farmer's income compare with the income of the nonfarm worker and what has been the relation of the farmer's income to the nonfarm worker's income? Appropriate comparisons between incomes of farm operators and nonfarm or industrial workers are extremely difficult to make.

Two important conditions must be met before comparisons of incomes between farmers and nonfarmers are appropriate: (1) The incomes should include compensation for similar services, and (2) occupations should be such that individuals may engage in either occupation they choose. In other words, the appropriate comparison is between Corn Belt farmers and the factory workers in nearby factories where Corn Belt farmers may obtain employment rather directly if they choose to discontinue farming. This comparison is more significant than one made between Corn Belt farmers and textile workers or miners in remote factories or mines where the flow of workers to Corn Belt farms or from Corn Belt farms to factories and mines is extremely difficult. Competition for employment and the income in the two occupations should be as direct as possible.

For these reasons, income comparisons in this study are between factory workers in Illinois and typical Corn Belt farm operators. To make the comparison more direct, the operator's return for his own labor and management is compared with the average annual earning of the factory workers. The incomes in this comparison are similar and are compensation for personal services only.[3] But even here comparisons are not quite direct. Some types of farms furnish rather full employment for the operator and his family while others furnish full employment only during seasonal peaks. If they do not provide work for the family, the family has little opportunity to add to the family earnings.

On the other hand, the annual earnings of factory workers used presuppose full employment. During some periods full employment may be the exception rather than the rule; then in frequent instances children of the factory worker may have a paper route or other after-school and vacation work and thus add to the family earnings. Furthermore, a nominal return on operator's investment in the farm is deducted from total farm income before operator's labor and management income is obtained. (Operator's labor and management income does not include any return on the operator's investment.) Some factory workers would like to obtain a similar return on such an investment, but the farmer is obliged to take certain risks that the factory worker might not accept. The investment on some typical farms amounts to nearly $30,000.

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[3] Operator's return for his labor and management is total farm income including changes in inventories, value of commodities used for human consumption on farms where grown, and estimated rental on farm dwellings less expenditures in production including unpaid family labor and return on investment.

Value of farm produce used in the home was obtained by applying prices farmers receive for similar produce to the quantity of the commodity used in the home.

Rental on farm dwellings was obtained through the following steps: (1) Interest rate on farm mortgages, North Central States, was applied to the value of farm dwellings; (2) total taxes on land and buildings was multiplied by the percent value of dwellings is of total value of land and buildings; (3) depreciation on dwellings was computed at 3.6 percent of annual average value; and (4) insurance was computed at 0.6 percent of value of dwelling. The sum of the results obtained in these four steps amounted to about 11 percent of the value of dwellings. Value of dwellings ranged from about $1,100 in 1910 to $3,000, in 1930.

Allowance for payment of any unpaid family labor, except operator, was obtained by applying weighted average (table 15) wage rates per worker with board, to the amount of time worked by members of the family on the farm.

Return on investment was obtained through the following: (1) Value of livestock at 6 percent; (2) average annual value of machinery and equipment at 6 percent; and (3) acres in the typical farm multiplied by weighted average net rent per acre. Rent per acre for the typical farm was obtained by weighting rental rates on farm land as obtained by the Bureau of Agricultural Economics for selected crop-reporting districts in the Corn Belt. These weighted rates for the respective types of farms were then checked against the average value of land and land and buildings on each of the typical farms.

During the period 1938–42 the average total value of land, buildings, machinery and equipment, and livestock was about $28,000 on cash-grain farms, $20,000 on hog-beef fattening farms, $13,000 on hog-dairy farms, and $10,200 on hog-beef raising farms.

The farmer has an independence of daily action that is rarely equaled in the better paying factory jobs. Low as farm incomes may fall, hundreds of farmers still prefer the farm to the city, and hundreds of "better-paid" factory workers would prefer the farm. This preference, which is real, is perhaps one of the chief reasons for the continued existence of many farm operating units.

Income comparisons are essential for a fuller understanding of farmers' and industrial or urban workers' problems.[4] Much research has been done in this field, but there is need for further research before straightforward comparisons between farm and nonfarm groups can be made without qualification or reservation. But this goes beyond the scope and purpose of this study. The comparisons presented herein, however, have validity and significance.

At this point one may compare the earnings of the average Illinois factory worker with operator's labor and management income on a typical Corn Belt farm. The course of these figures during the 33 years is shown in table 12 and figure 6. The main features of the movements are the smallness of the changes in earnings of Illinois factory workers compared with those of operators of typical Corn Belt farms and the wide differences between labor and management incomes of operators on different types of farms.

The annual earnings of these factory workers, which began to rise after 1915, continued to increase until 1926 when the index, relative to 1910–14, reached 233. From 1926 to 1929, inclusive, the earnings remained about the same, but they began to decline after 1929, and in 1933 they stood at 148 percent of 1910–14. After the depression, these earnings rose almost steadily and by 1942 they were nearly three times as high as the earnings in 1910–14.

In 1915, labor and management income of operators of typical hog-dairy farms stood at only 26 percent of 1910–14. Because of the strong demand for farm produce and high prices for them during World War I, operator's labor and management income rose rapidly, by 1918 it stood at 351 percent of 1910–14. But the depression of 1921 brought the income down to 76 percent of the base period. The inflation of the late 1920's brought it up nearly to the level of World War I but the depression of the early 1930's reduced it to an unprecedented low (9 percent of 1910–14). Recovery was slow. From 1937 to 1940 the index of operator's labor and management return on hog-dairy farms averaged 126 compared with 216 for average annual earnings of Illinois factory workers, both indices based on 1910–14=100.

Labor and management incomes of operators of typical cash-grain, hog-beef fattening, and hog-beef raising farms varied considerably more than did the incomes of operators of typical hog-dairy farms. Perhaps this is to be expected. In 1921, 1931, and 1932 the typical cash-grain farm operator did not have enough money left, after paying cash farm expenses, to pay members of his family who had worked without wages and to allow a nominal return on his investment. But in 1942, after paying all expenses including family labor and allowing a return on his investment, he received about $4,000 as compensation for his own management and labor.

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[4] BLACK, J. D. PARITY, PARITY, PARITY. 367 pp. Cambridge, Mass. 1942. See ch. XI.

TABLE 12.—*Operator's labor and management income, typical Corn Belt farms, and average annual earnings of Illinois factory workers*

[Index numbers 1910–14=100]

Year	Operator's labor and management income [1]				Annual earnings Illinois factory workers [2]
	Hog-dairy	Cash-grain	Hog-beef fattening	Hog-beef raising	
1910	153	143	133	165	99
1911	38	78	73	57	95
1912	55	59	40	72	98
1913	130	143	147	136	104
1914	124	77	107	70	104
1915	26	116	43	32	106
1916	78	189	175	134	118
1917	168	356	319	247	137
1918	351	632	574	446	172
1919	310	423	359	321	191
1920	188	187	125	215	239
1921	76	(3)	51	51	212
1922	106	60	116	105	202
1923	91	116	69	84	220
1924	139	257	149	134	224
1925	169	142	119	171	227
1926	327	285	336	320	233
1927	261	226	374	123	232
1928	171	200	288	150	231
1929	241	280	412	240	233
1930	152	180	239	139	221
1931	47	(3)	25	(3)	192
1932	9	(3)	(3)	(3)	152
1933	47	77	33	39	148
1934	35	48	6	6	166
1935	237	188	197	106	180
1936	276	358	320	174	195
1937	148	196	160	49	218
1938	123	200	176	113	204
1939	135	313	212	135	217
1940	97	284	197	124	225
1941	314	470	463	309	255
1942	450	882	870	458	294

Figure 6 discloses the relationship of operator's labor and management income to the average annual earnings of Illinois factory workers. This ratio is obtained by dividing the index of operator's labor and management income by the index of average annual earnings of Illinois factory workers (both indices based on 1910–14) and multiplying the resultant ratio by 100.

During the 33 years, the ratio of operator's labor and management income to average earnings of Illinois factory workers was less than 100 in 17 years for cash-grain and hog-beef fattening farm operators, 20 years for hog-dairy, and 23 years for hog-beef raising operators. Since 1919, the income ratio has exceeded 100 in only 4 years on hog-beef raising farms, 7 years on hog-dairy farms, and 9 years on cash-grain and hog-beef fattening farms. During 1938-42, the ratio averaged 88 on hog-dairy farms, 90 on hog-beef raising farms, 150 on hog-beef fattening farms, and 170 on cash-grain farms.

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[1] Operator's return for his labor and management is total farm income including changes in inventories, value of commodities used for human consumption on the farms where grown, and estimated rental on farm dwellings less expenditures in production including unpaid family labor and return on investment.

[2] Survey of Current Business. Annual supplement 1940 and 1942, and March 1943. Information for 1923–42 based on index numbers of weekly average earnings of Illinois factory workers reported in the March 1943 Survey of Current Business and 1940 and 1942 Annual Supplements. Information for 1909, 1914, 1919, 1921, and 1923 based on earnings of Factory Workers, 1899 to 1927, in U. S. Bureau of Census, Monograph No. 10, Analysis of Pay Roll Statistics, adjusted to the level for 1923 as reported in the Survey of Current Business ($1,414 adjusted to $1,407). Information for other years interpolated from estimates made by the Bureau of Agricultural Economics.

[3] No return to operator for his labor and management if family labor and return on operator's investment in the farm are computed at stipulated rates.

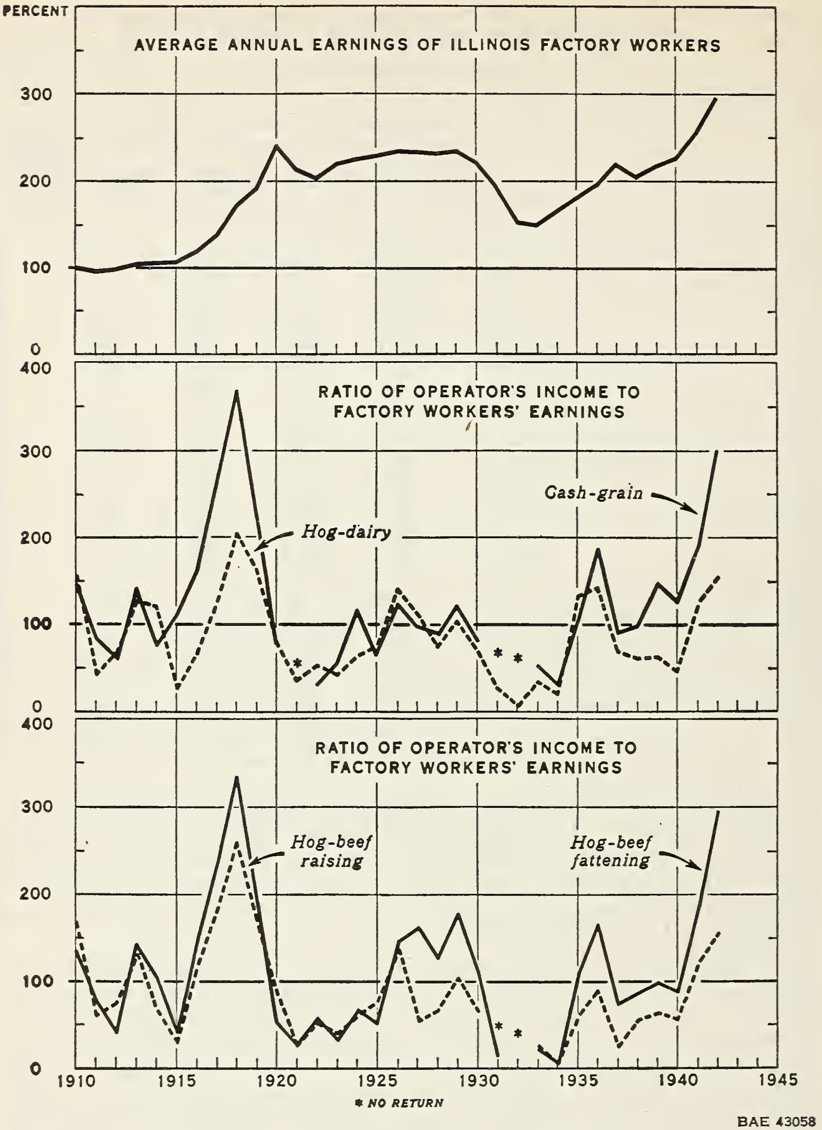

FIGURE 6.—AVERAGE ANNUAL EARNINGS OF FACTORY WORKERS AND RATIO OF OPERATOR'S INCOME, TYPICAL CORN BELT FARMS, TO AVERAGE ANNUAL EARNINGS OF ILLINOIS FACTORY WORKERS, 1910–42. INDEX NUMBERS (1910–14=100).

SUMMARY OF CHANGES AND ADJUSTMENTS

Typical Corn Belt farmers are now operating larger farms and doing considerably more business than at any time during the last 30 years. This has come about primarily through the use of improved crop varieties, better rotations, better livestock, labor-saving machines, and improved management.

Their farms have undergone many adjustments during this time. These adjustments have been greater on the larger farms and on the crop farms. The typical cash-grain farmer is now operating about 35 percent more land than he was 30 years ago, but he has increased his output by nearly 70 percent and has decreased the amount of labor hired by approximately 33 percent. The total amount of labor used on the farm has been reduced from a yearly average of about 4,500 hours in 1910–14 to 4,100 hours in 1938–42, a reduction of 9 percent. In other words, the family, even though now smaller than the average family 30 years ago, is able to do relatively more work. More than 93 percent of these farmers now have tractors. Over 90 percent of their corn acreage is planted with hybrid seed corn.

At the other extreme are the hog-beef raising farms. As these farms are much smaller than cash-grain farms, they have not been able to make the most effective use of labor-saving devices. Less than 40 percent now have tractors. Their land is not so level, not so productive, and less acreage is cultivated than on other typical farms. Less than half of the corn acreage on hog-beef raising farms is planted with hybrid seed corn. The droughts of 1934 and 1936 were much more severe on these farms and, as a result, liquidation of breeding herds was more drastic than on others. In spite of this, their combined production of crops and livestock in 1938–42 was higher than for any other 5-year period and was 24 percent higher than in 1910–14. They are hiring 46 percent more labor than in 1910–14 but slightly less than during the years before the droughts, depression, and the beginning of the Agricultural Adjustment Administration Program.

Hog-dairy farmers have gradually increased the number of milk cows in the herds and are feeding and milking higher producing cows. They have increased the production of other enterprises. In 1938–42 their index of total production was 154, based on 1910–14 as 100. This is their highest output for any 5-year period. Because the family was already working nearly to capacity in handling the dairy and other livestock and crop enterprises, the addition of more cows, more hogs, and more acres increased the amount of hired labor. It was increased in 1938–42 by 124 percent over 1910–14 in order to handle this production. In other words, most of the increased production had to be handled by hired hands.

Hog-beef fattening farmers have shifted from a system in which they bought most of the cattle they fattened to a system in which they breed and raise most of the cattle they feed out. This has been accomplished by increasing the size of farm and by shifting to more productive hay and pasture. In 1938–42, hay production was 27 percent greater than in 1910-14 and 14 percent greater than in 1928–32, in spite of a bumper hay yield in 1929. Pasture acreage was 20 percent greater in 1938–42 than in 1928–32. Corn yields were up nearly 10 bushels over either 1910–14 or 1928–32. The combined index of crop and livestock production in 1938–42 stood at 126, based on 1910–14 as 100.

The income of each of these groups of farmers has moved up with the shifts and adjustments which each has made to handle more resources more skillfully. In 1938–42 the index of operator's labor and management income on cash-grain farms stood at 430; hog-beef fattening at 384; hog-beef raising at 228; and hog-dairy at 224—each based on 1910–14 as 100.

This variation demonstrates considerable differences among operators, and general improvement of all, over 1910–14. However, the growth in average annual earnings of Illinois factory workers has been much more steady than the average farm operator's annual labor and management income and in some instances the earnings show more improvement. In 1938–42 the index of average annual earnings of Illinois factory workers stood at 239 based on 1910–14 as 100.

PROCEDURE AND METHODOLOGY

Determination of Representative Counties by Type

Statistical information by counties supplied much of the basic material for the study here reported and was the primary basis for selecting the counties representing specified types of farming. Statistical information from representative counties was used to measure the year-to-year changes that have taken place on typical commercial family-operated farms.

The counties selected as representing the major patterns of agriculture in the Corn Belt are shown in figure 1. They have rather clearly defined patterns of agriculture or types of farming. The criteria used when selecting these counties were: Numbers, types, and classes of livestock; acreages of important crops; percentage of farmers reporting their major source of income from specified items; and proportion of total income from specified items. For example, the United States Census of Agriculture indicates that in 1939 practically 90 percent of the farmers in Champaign County, Ill., reported that their major source of income was from the sale of field crops, such as corn, soybeans, and oats. About 74 percent of their total farm income was from the sale of crops; only 21 percent was from the sale of livestock and livestock products; less than 5 percent was from the sale of dairy products. More than 75 percent of the land in this county was in crops. More than 34 percent of the land in farms was in corn and less than 4 percent in hay. On January 1, 1940, there was an average of only 5.8 head of cattle and calves, and 5.7 hogs and pigs, for each 100 acres of land in farms. There were less than 2.5 head of cows and heifers kept mainly for milk production for each 100 acres of land in farms.

In contrast only 11.0 percent of the farmers in Bremer County, Iowa, indicated that their major source of income in 1939 was from the sale of field crops. But more than 84 percent indicated that their major source was from the sale of livestock and livestock products. Nearly one-third of these reported that dairy products were their most important source of income. The major source of farm income (more than 41 percent) was from the sale of livestock products in this county. There were 16 cows and calves (about 10 were kept for milk production) and 16 hogs and pigs for each 100 acres of land in farms in the county. Sixteen percent of the total land in farms was in hay.

Information for other years and from other reports gave similar information for these counties. Data for years other than 1939 and 1940 were used, but for the most part information pertaining to the years 1939 and 1940 was given primary consideration. Data from type-of-farming studies and from miscellaneous publications were also employed in the selection of representative counties.

Counties selected in each State to represent hog-dairy farming had a high ratio of livestock, particularly milk cows, to farm land, a high proportion of farmers reporting livestock and livestock products as their major source of income, a high proportion of total income from the sale of livestock and livestock products, and a high proportion of land in production of roughages and pastures, in comparison with other counties. On the other hand, in counties selected as cash-grain counties the farmers received most of their income from the sale of crops, there was a small ratio of livestock to land, and a large proportion of the land was in grain crops (table 13).

TABLE 13.—*Comparisons of certain data for selected counties representing types of farming in Illinois and Iowa, 1939*

Item	Livestock per 100 acres of land in farms in—			
	Illinois		Iowa	
	Cash-grain	Hog-dairy	Cash-grain	Hog-dairy
	Number	*Number*	*Number*	*Number*
Cattle and calves	6.2	15.7	8.8	14.1
Cows kept for milk production	2.6	8.9	3.6	7.4
Hogs and pigs	5.5	11.2	12.9	12.2
Sows and gilts for farrowing	1.4	4.0	4.5	5.5
	Land in specified crops			
	Percent	*Percent*	*Percent*	*Percent*
Corn	36.2	23.3	34.0	19.5
Oats	17.0	14.5	23.1	15.6
Wheat	1.6	.1	.1	.1
Hay	4.3	14.7	7.4	14.9
Other	15.4	5.5	6.3	1.2
Total cropped	74.5	58.1	70.9	51.3
	Farms reporting major source of income from crops sold or traded			
Livestock	5.4	33.4	24.7	63.8
Dairy products	1.4	40.9	1.7	14.8
Poultry and poultry products	1.2	2.8	1.9	2.7
Field crops	86.8	9.2	65.8	7.7
Farm produce used in home	3.7	7.7	4.1	8.4
Other products	1.5	6.0	1.8	2.6
Total	100.0	100.0	100.0	100.0
	Proportion of income from various sources			
Livestock	15.3	40.1	34.7	45.8
Livestock products	9.2	39.2	11.1	33.1
Dairy products	5.2	33.2	6.0	23.0
Crops	69.4	12.9	47.4	8.0
Farm produce used in farm household	6.1	7.8	6.8	13.1
Total	100.0	100.0	100.0	100.0

Within a given State little variation was tolerated in the major criteria for selecting counties as representative of a certain type of farming but the limits varied between States. For example, the number of cattle and calves per 100 acres of land in farms in the hog-dairy counties ranged from 13.3 in Allamakee County to 15.9 in Bremer County, Iowa, but from 8.1 in Hancock County to 11.2 in Marshall County, Ind. The proportion of income from livestock products ranged from 29.5 percent in Allamakee County to 41.2 percent in Bremer County, Iowa; whereas income from this source in Indiana ranged from 18.3 percent in Hancock County to 35.0 percent in Marshall County. Similar relationships existed between counties and States in the proportion of farmers reporting livestock products as their major source of income. In other words, a hog-dairy farm in Iowa does not have exactly the same organization as a hog-dairy farm in Indiana or Illinois (that is, does not have exactly the same number of milk cows, number of hogs, and acres of corn). Likewise, a cash-grain farm in Illinois is not exactly like a cash-grain farm in Indiana or Iowa, but they are very similar and differ significantly from hog-dairy, hog-beef raising, and hog-beef fattening farms.

Some of these differences among types of farms may be seen in table 14. (See also table 1.) In table 14, groups of counties in each State are given equal weight and each State represented is given equal weight. Not all States are represented in each type. For example, hog-dairy farming was not common enough in any of the Corn Belt counties in Nebraska to justify inclusion, and cash-grain farming was not common enough in any northern counties of Missouri to justify its use.

Counties representing hog-dairy farming had twice as many milk cows and heifers per 100 acres of land as did the other three types of farms. They were second to counties representing hog-beef fattening farming in numbers of hogs and were first in acres of hay. Slightly more than half of the land in hog-dairy counties is cropped. On the other hand, over 70 percent of the farm land in the counties representing cash-grain farming is cropped—most of it in grains. Few livestock are kept in the cash-grain farming counties. Beef cows, pasture, and roughage are more common in the counties representing hog-beef raising farms than in other counties.

Differences in farming among these groups of counties are disclosed in table 14. The dominance of the hog-dairy combination is particularly noticeable in the hog-dairy counties; the dominance of grain farming and the absence of livestock and roughages are noticeable in the cash-grain counties; the dominance of hogs and beef and a comparatively high proportion of concentrate feeds are noticeable in the hog-beef breeding and fattening counties; and the hog-beef combination together with a small quantity of feed grains and a large quantity of roughage is noticeable in the hog-beef raising counties.[5]

SELECTION OF INCOME AND EXPENSE DATA

Once the areas and types for study are selected, the analysis must move toward sources of reliable data that will give a year-by-year picture of exactly what is happening on each type of farm. These data must include each item of expense and income, including crop and livestock farm history that may never appear in an off-farm role. The following pages describe the methods used in selecting and classifying each set of data, according to its proper function in type and location.

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[5] Counties that were out of the Corn Belt proper, such as the western portion of Nebraska, the southern portions of Missouri, Illinois, and Indiana, and the southern and eastern portions of Ohio, were omitted, as well as sections adjacent to large cities and milksheds.

TABLE 14.—*Livestock, land use, and proportion of income from certain sources for selected counties representing types of farming in Corn Belt States, 1939*

Item	Hog-dairy	Cash-grain	Hog-beef fattening	Hog-beef raising
	Livestock per 100 acres of land in farms			
	Number	*Number*	*Number*	*Number*
Cattle and calves over 3 months	11.1	7.4	10.0	8.2
Cows and heifers—				
Kept for milk production	6.0	3.0	3.0	3.0
Kept for beef production	.6	.7	1.3	1.6
Hogs and pigs over 4 months	12.9	7.9	16.3	10.5
Sows and gilts for farrowing	3.9	2.3	4.4	2.7
	Land in specified crops			
	Percent	*Percent*	*Percent*	*Percent*
Corn	20.4	31.2	29.6	19.5
Oats	9.7	15.3	8.8	5.7
Wheat	4.8	6.2	4.4	4.9
All hay	12.0	6.4	7.9	9.4
Other	6.3	11.2	8.0	8.3
Total cropped	53.2	70.3	58.7	47.8
	Farms reporting major source of income from certain produce sold or traded, 1939			
Livestock	43.6	16.6	46.9	44.3
Dairy products	18.0	4.0	3.4	5.8
Poultry and poultry products	3.4	3.7	2.3	3.7
Field crops	14.3	64.7	32.2	22.7
Farm products used in home	16.5	8.3	12.5	20.2
Other products	4.2	2.7	2.7	3.3
Total	100.0	100.0	100.0	100.0
	Proportion of income from various sources			
Livestock	41.0	26.1	51.2	44.8
Livestock products	28.7	14.5	12.0	19.1
Dairy products	20.1	7.7	6.3	9.4
Crops	18.1	51.3	27.4	22.7
Farm produce used in farm household	12.2	8.1	9.4	13.4
Total	100.0	100.0	100.0	100.0

This study is designed to show conditions as they actually exist on typical farms. To do this most appropriately the assumption is made that the typical farm is a "statistical" or average farm. In other words, there are several farms, say 1,000, of a given type. Each is an individual farm much like all the others of the same type in general organization and make-up. Yet each may differ from the others in minor details, as farms of a given type differ from each other in a given area. For example, the 1,000 cash-grain farms may have about the same proportion of land in crops and the same number of livestock, but some may be operated entirely by horses whereas others may be operated entirely by tractors and still others operated by both horses and tractors. Some may have combines, corn pickers, telephones, electrical service, and so on, whereas others may have none of these items and services. The typical farm represents the average of this rather homogeneous group of 1,000 farms. Thus the typical farm may have fractions of animals and equipment such as 18.6 head of cattle, 3.2 horses, 50 percent of a tractor, and 70 percent of a telephone. The income and expenditures are computed accordingly.

ACRES OF CROPS AND SIZE OF FARM

Tabulations for each county used in this study included numbers of farms, size of farm, cropland harvested, crop production, crop failure, cropland idle, pasture, woods, number of farms reporting production of corn, number of farms reporting production of oats, numbers of each type and class of livestock, number of farms reporting production of major types of livestock and similar information. These data were tabulated from each of the census reports, from 1910 to 1940 inclusive, by groups of counties representing a specific type of farming in a given State. Except for number of farms reporting the production of corn, oats, and livestock for each county, similar information was also available in most States from 1910 to 1941 in Yearbooks of Agriculture and annual reports on crops and livestock.

These two sources gave rather complete information on county agriculture for each year from 1910 to 1941, with duplicate data for the census years. Data from the two sources were checked against each other, so that any interpolations between census years might be appropriate.

Summations of all the data were made for each year by groups of counties representing a given type of farming in a State. The bushels of oats produced each year for a given group of counties were divided by the acreage in oats in the respective year. This gave the yield of oats for each year for a given type of farm (hog-dairy, for example, in Ohio). Yields of other crops were ascertained in the same way.

The total acres in farm land, acres of each crop, acres of pasture, etc., for each group of counties representing a given type of farming in a State were divided by the number of farms reporting the production of corn. This procedure gave acreages of crops and farm sizes that appeared to be representative of the type of farming in the respective county groups.[6] For example, by this procedure a farm of 158 acres, with 27.8 acres in corn, 27.6 acres in small grains, and 25.2 acres in hay, resulted in the counties representing the hog-dairy area of Iowa, in 1940. Nearly 45 percent of the farms in the hog-dairy counties in Iowa fall within the size limits of the 100- to 179-acre groups. A farm of about 180 acres, with about 150 acres in crops was found for the cash-grain area of Iowa. About 40 percent of the farms in the cash-grain counties in Iowa fall within the 140- to 219-acre size group. A farm was considered representative or typical in size if the total acres in the farm corresponded closely to the modal size group (the most common size group) in a county or group of counties. No significant differences were found among counties within a type group.

The number of farms reporting the production of corn was listed only by the Census. A ratio of farms reporting production of corn to total number of farms was established and was employed to ascertain farm size and acreages of crops for the intercensus years.

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[6] It was thought that any commercial farm in the counties representing the Corn Belt would probably have some corn and so would be included in farms reporting production of corn, as reported by the census. Using this number of farms instead of the total number in a county or group of counties would eliminate subsistence and part-time farms. This appeared to be the most appropriate method of ascertaining the size and acreages in various uses on a representative or a typical farm. A farm much too small to be considered representative was obtained by dividing total land in farms and acreages in various uses in a county or group of counties by the total number of farms in that county or group of counties. On the other hand, an acerage far too large to be considered representative was obtained by dividing acreage in each crop by the number of farms reporting the production of that crop.

WEIGHTS USED

This procedure gives the average farm size and acreages and yields of crops by groups of counties representing a given type of farm in each State. To ascertain the representative farm of a given type for the Corn Belt it was necessary to weight the information on that type of farm in each of the States as given by the respective group of counties. The weight given each State (the per farm data obtained from the group of counties representing a given type of farm) for hog-dairy farming, for example, was directly proportional to the number of hog-dairy farms in that State in relation to the total number of hog-dairy farms in the Corn Belt. The weights were obtained largely from an area and farm analysis of type-of-farming studies and from census data, farm-management studies, and farm-management surveys in the Corn Belt. These statistical data were supplemented with information obtained by general observation and by consultation with persons who have first-hand knowledge of Corn Belt agriculture. The weights are given in table 15. These weights were used for all production and price data.[7]

The average acreage, production of crops, number of livestock, and other information for the representative Corn Belt hog-dairy farm were obtained directly by multiplying these items from the respective hog-dairy counties in Ohio and Indiana by 23 each, in Illinois by 18, in Iowa by 33, and in Missouri by 3. In each case the product was divided by 100.

TABLE 15.—*Relative number of given types of farms in Corn Belt States*

State	Hog-dairy	Cash-grain	Hog-beef fattening	Hog-beef raising
	Percent	*Percent*	*Percent*	*Percent*
Ohio	23	2		6
Indiana	23	5	10	10
Illinois	18	50	20	18
Iowa	33	26	36	34
Missouri	3		14	20
Nebraska		17	20	12

To obtain yield or production data for a typical farm of a given type for the Corn Belt all yields or data for per unit production such as yield of corn per acre, butterfat production per cow, and eggs laid per hen, were carried one step farther in the weighting process. The computation of corn production in 1940 for the typical hog-dairy farm will demonstrate the procedure:

$$\left[\begin{array}{c}\text{Ohio}\\(28.6\text{ acres}\times 40.7\text{ bushels})\times 23\text{ weight}\end{array}\right]+\left[\begin{array}{c}\text{Indiana}\\(30.5\times 38.2)\times 23\end{array}\right]+$$

$$\left[\begin{array}{c}\text{Illinois}\\(30.9\times 64.6)\times 18\end{array}\right]+\left[\begin{array}{c}\text{Iowa}\\(27.8\times 54.3)\times 33\end{array}\right]+\left[\begin{array}{c}\text{Missouri}\\(26.3\times 38.2)\times 3\end{array}\right]\div 100=$$

1,423 bushels of corn.

This production, divided by the weighted acreage (29.1) (acres per farm for the respective counties in a given State × the assigned weight), gives the weighted yield (48.9).

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[7] It was impossible to obtain prices on a county basis for all items. Several comparisons were made between prices on a State basis and on a county and crop-reporting district basis. In most instances the differences were insignificant. In some instances the price level of a certain product was a little higher for a crop-reporting district than for the State, but the difference was usually consistent from year to year. For this reason State prices were used in most instances and were weighted according to weights in table 15.

NUMBERS AND PRODUCTION OF LIVESTOCK

Information on livestock was handled in about the same way as that on crops. Numbers of livestock, by type and class, together with any information on production, were tabulated for each county for each year from 1910 to 1942. This information was also tabulated and totaled by the same groups of counties as was the information on crops. The number of livestock per farm was obtained directly by dividing the number of livestock on farms in the particular group of counties representing a given type of farm by the number of farms reporting the production of corn in those counties.[8] This is the same denominator that was employed to obtain the acres of crops per farm. For example, the total number of cattle and calves on farms January 1, 1940, for the 7 hog-dairy counties in Iowa was divided by the total number of farms in those 7 counties reporting the production of corn in 1940. This procedure gave approximately 24 head of cattle and calves for a hog-dairy farm in Iowa, 13 head for Missouri, 28 for Illinois, 11 for Indiana, and 12 for Ohio. These numbers, when weighted by the appropriate weights in table 16 gave 18.6 head of cattle and calves for a typical hog-dairy farm in the Corn Belt.

The composition of a typical dairy herd for a hog-dairy farm in the Corn Belt was established each year from the total number of cattle and calves on the farm January 1. Table 16 presents some of the details.

TABLE 16.—*Composition of cattle herd on a typical hog-dairy farm in the Corn Belt, 1940*

Animal	Age in years (1)	Number (2)	Percent (3)	Animal units (4)	Sales	
					Normal (5)	Actual (6)
Total		18.6	100.0	15.6		
Bulls	Mature	.4	2.2	.4	2.3	1.6
Cows	Mature	11.7	62.8	11.7		
Heifers	1½–2½	2.6	14.0	2.1		
Do	1–1½	1.3	7.0	.6		
Calves	0–1	2.6	14.0	.8	7.5	7.5

The percentages as given in column 3 of table 16 represent the normal composition of a typical dairy herd and were applied to the total number of cattle and calves on farms each year to obtain the number of animals of each age group and to obtain annual replacements. In 1940, for example, 14 percent or 2.6 heifers were available for replacing old cows or for increasing the size of herd, provided no deaths occurred. However, the normal death loss amounts to 2.1 percent. If the inventories of dairy animals were the same in 1940 and 1941, 2.3 mature animals would be culled and sold during 1940. But the herd was increased from 18.6 head in 1940 to 19.7 head in 1941. There were 12.8 head of mature cattle in 1941 compared with 12.1 in 1940. This meant either that purchases occurred or that animals which normally would be sold were retained. Purchases of dairy animals, except bulls, were not considered normal. Therefore, 0.7 mature animal was retained (12.1+0.7=12.8) and 1.6 mature animals were sold (2.3–0.7=1.6). Column 6 gives the actual sales for 1940.

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[8] The number of farms reporting the production of cattle and calves, hogs and pigs, work animals, and corn, according to tests, appear to have a fairly definite relationship to each other.

The number of hogs on farms January 1 each year was obtained in the same way as number of cattle and acres of crops—by dividing the number of hogs and pigs on farms in the respective counties by the number of farms reporting the production of corn. The results, when weighted by the respective weights in table 15, gave the number of hogs on the typical farm on January 1.

To obtain the annual net production of hogs on the typical farm, a ratio of the net pounds of hog produced per hog on farm January 1 was established each year for each State. Net pounds of hog produced per hog on farm January 1 could be obtained directly only on a State basis.[9] This was obtained directly by dividing the annual net production of hogs in a given State by the number of hogs on farms January 1 of that year. This ratio ranged from 220 pounds to more than 400 pounds. This ratio was then applied to the number of hogs per farm in a given group of counties in a State. The result for each State was in turn multiplied by the weights in table 15.[10]

The number and production of sheep and lambs, the number and production of milk cows, the number and production of layers, and the number of horses and mules for each of the typical farms were obtained in exactly the same way as the number and production of hogs and pigs.

FEED REQUIREMENTS

The next step after obtaining crop and livestock production for each of the typical Corn Belt farms was to ascertain disposition of the crops. Most of the crops on the typical Corn Belt farm are fed on the farm where grown. The first step was to obtain the quantity of feed required each year to feed the livestock.

Annual feed requirements were first established for each unit of livestock by type and class. In doing this, consideration was given to increased efficiencies over the period of years in feeding livestock, the relative number and production of each type and class of livestock, quantities of feeds produced, availability of feeds, possibilities of substituting one type of feed for another, years of feed abundance and years of feed scarcity, and condition and weights at which livestock are disposed.

The unit feed requirements for each type and class of livestock multiplied by the respective number of livestock gave the annual quantities of feeds required to carry the livestock.

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[9] U. S. Bureau of Agricultural Economics. FARM PRODUCTION AND INCOME FROM MEAT ANIMALS, 1930–43 [Processed].

[10] The net production of hogs on the typical cash-grain farm in 1940 was obtained in the following manner:

$$\left[\overset{\text{Ohio}}{(24.8\ \text{hogs}\times 313\ \text{pounds produced per hog})\times 2\ \text{weight}}\right]+\left[\overset{\text{Indiana}}{(21.7\times 337)\times 5}\right]+\left[\overset{\text{Illinois}}{(30.0\times 327)\times 50}\right]+\left[\overset{\text{Iowa}}{(46.2\times 314)\times 26}\right]+\left[\overset{\text{Nebraska}}{(20.5\times 272)\times 17}\right]\div 100=10{,}146\ \text{pounds live hog.}$$

SEED REQUIREMENTS

Average seed requirements per acre under certain conditions were readily available from farm-management and input-output studies. Normal rotations and therefore acreages seeded each year were readily obtained from the acres of crops and use of land each year on each of the typical farms. The seed requirements per acre multiplied by the number of acres of each crop seeded each year gave the total seed requirements for the typical farm.

FEED INVENTORIES

As the study was set up, for various reasons, on a calendar-year basis, it was necessary to obtain the carry-over of crops on January 1 each year. Several studies report the carry-over of crops; either the percentage of the previous year's crop on hand as of a given date or the absolute quantity on hand as of a given date. Information from the various sources was summarized and from this an estimate of the proportion of the previous year's crop on hand January 1 each year was made for each crop for each of the typical farms. The information seemed to indicate that there was less difference in carry-over, in terms of percentage of previous year's crop, from year to year between types of farms than on the same farm.

For example, the proportion of the previous year's corn crop on hand January 1 following a year of drought was always comparatively high regardless of type of farm. The difference in percentage of the corn crop held after the drought and after a normal crop was always greater on the same farm than the percentages between types in the same year. The absolute quantity carried over from drought years was always smaller than from normal years. The quantity held over following a year of drought was usually less on livestock farms than on cash-grain farms. This is particularly true of some crops.

FEED BALANCE

From the information on crop production, crop inventories, seed requirements, livestock production, and feed requirements, it was possible to set up a feed-crop livestock balance each year and to ascertain the quantity of crops sold or purchased. The following information on production and distribution of corn in 1937 for a typical hog-dairy farm gives in tabular form the arrangement of the information on each crop produced on the farm.

Corn, pounds

Opening inventory	31, 046	Fed	54, 970
Production	81, 704	Closing inventory	58, 827
Seed	292	Remainder	1, 339

All feeds were carried in pounds for convenience in substituting one feed for another. Where an excess of one feed occurred and a deficit of another feed occurred, substitutions of feeds were made on the basis of grain equivalent, but only after due consideration was given to the type of livestock fed and the quantity of the feed deficit or excess. One pound of grain equivalent was considered as 1 pound of corn, 1 pound of small grains, ½ pound of soybeans, 2½ pounds of hay, or 5 pounds of corn silage. In practically no case was a large surplus of roughage found together with a deficit of concentrate feed, or vice versa. But caution was used to prevent the substitution of roughages for concentrate feeds in large quantities, particularly on farms where the predominant type of livestock fed required concentrate feed and where concentrate feeds constituted the limiting factor in the feeding program.

In the example given for the hog-dairy farms in 1937, in addition to the deficit of 1,339 pounds of corn, there was a deficit of 1,630 pounds of small grain and 8,604 pounds of hay, but there was an excess of corn silage equal to 2,968 pounds of grain equivalents. As roughages were usually bought (almost never sold) on hog-dairy farms and as the feeding program and type of livestock were such that the apparent excess roughage in 1937 could be appropriately substituted for concentrates, the silage was substituted for the grain fed to the bull and other stock animals, and 4.3 tons of hay were purchased. Hog-dairy farmers usually bought some feeds but large quantities were seldom required.

Sales and Income

CROPS, LIVESTOCK, AND LIVESTOCK PRODUCTS

The physical or quantitative data for all crops and livestock were retained each year throughout the study. The quantity of each product sold was expressed in the conventional unit (bushels, tons, hundredweight, or pounds) and supplied the appropriate weight for computing the index numbers of prices and income for individual commodities or groups of commodities. This information on all items was later combined as one of the component parts of the index series. Table 17 illustrates the way in which the information was combined.

The information for 1939 was selected for table 17 because in that year some crops were sold. Typical hog-dairy farmers usually bought feeds instead of selling them. The oats crop was always fed. The quantity of each product sold in the given year, 1939 in this instance, is represented by q_1. Similarly, the price received by the producer for each product sold in the given year is represented by p_1. These are weighted average prices. They are average prices received by farmers in the six Corn Belt States weighted for the respective types of farms by the weights given in table 15. The average price received by farmers during the period 1935–39 is represented by p_0. The average quantity of produce sold by the typical producer during this period is represented by q_0. These values, q_0 and p_0, are the base values employed later in obtaining the index of quantity and price.[11]

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[11] The years 1935–39 were selected as base years because they are recent years; because many items such as soybeans, hybrid seed corn, tractors, combines, corn pickers, etc., were common in them whereas they were practically nonexistent in the early years covered by the study; and because they were considered fairly normal; no major droughts, wars, or depressions occurred.

The index of price for a group of items sold in a given year is obtained thus: $\frac{\Sigma q_0 p_1}{\Sigma q_0 p_0} \times 100$. The index of quantities sold is obtained thus: $\frac{\Sigma q_1 p_0}{\Sigma q_0 p_0} \times 100$. Both q_0 and p_0 are weighted averages of the information for 1935–39.

TABLE 17.—*Income, prices received, and quantity of produce sold, typical hog-dairy farm, Corn Belt, 1939*

Item	Unit	q_1	p_1	q_1p_1	q_0	q_0p_1	p_0	q_1p_0
Crops:								
Corn	Bushel	120	0.51	61.20	66	33.66	0.61	73.20
Wheat	Bushel	117	.63	73.71	85	53.55	.78	91.26
Soybeans	Bushel	43	.75	32.25	25	18.75	.79	33.97
Hay	Ton		5.77		.84	4.85	9.32	
Livestock:								
Cows	Hundredweight	20.0	6.60	132.00	18.7	123.42	6.22	124.40
Veal	Hundredweight	11.6	9.06	105.10	11.7	106.00	8.47	98.25
Hogs	Hundredweight	123.4	6.36	784.82	94.0	597.84	8.36	1,031.62
Poultry	Pound	532.0	.129	68.63	544.0	70.18	.148	78.74
Sheep	Hundredweight	4.2	8.16	34.27	4.2	34.27	8.25	34.65
Livestock products:								
Butterfat	Pound	2,468	.230	567.64	2373	545.79	.283	698.44
Eggs	Dozen	781	.150	117.15	778	116.70	.189	147.61
Wool	Pound	66	.230	15.18	64	14.72	.252	16.63
Total				1,991.95		1,719.73		2,428.77
Government payments.				162.54		117.22		117.22
Total (including Government payments).				2,154.49		1,836.95		2,545.99

The sales of crops are taken directly from the feed-livestock balance sheet as given above, after making allowance for all debits such as opening inventories and production and all credits such as feed, seed, and closing inventories.

The numbers of cows and vealers sold each year come directly from the information on numbers of livestock in the herd each year, with due consideration for death loss, replacements, and calf crop, as presented in table 16. The average weights of cows and vealers sold each year were obtained by applying an index of weights of cows and veals as reported in the Drovers' Journal to the average weights of the respective livestock as obtained from farm-management surveys and studies in the respective type areas.

The hundredweight of hogs and sheep sold was obtained by multiplying the respective numbers of each type of livestock on farms January 1 each year by the net annual production of live hogs or sheep per head on farms January 1, as explained in the section, Numbers and Production of Livestock. Before sales were obtained, deductions from farm production were made in all cases for farm-grown produce used for human consumption on the farm where grown.

The poultry enterprises on these farms are typical farm flocks. The number of layers on farms each year was obtained in the same way as numbers of other livestock, as given above. Enough baby chicks are bought each year to replace cull layers, to allow for death losses in the flock, and to permit changes in the size of flock from year to year. The quantity (pounds) of poultry sold each year is obtained by deducting the number of birds used in the farm home from the number of culls and cockerels and multiplying the result by the average weight of birds sold.[12] Numbers of culls and cockerels are obtained directly from information on the poultry enterprise. Ordinarily 60 percent more birds were raised to laying age than were maintained in the laying flock.

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[12] The average weight per bird sold from farm flocks was obtained from U. S. BUREAU OF AGRICULTURAL ECONOMICS. FARM PRODUCTION AND DISPOSITION OF CHICKENS AND EGGS, 1909–43. 1943. [Processed.]

Sales of livestock products were readily obtained by multiplying the number of animals by the average production per animal and deducting the quantity of the respective livestock products fed and used in the farm home. It was not possible to obtain milk production per cow and egg production per hen on a county basis for all years. Dairy-type cows, of course, should generally be higher-producing cows than dual-purpose cows or cows that are not fed and culled strictly for milk production. It was believed that layers on hog-dairy farms on which considerable whey and skim milk are available would get more milk products and better care than hens on cash-grain or beef farms, and would therefore produce more eggs. Statistics support these assumptions. Therefore, relationships between county, type of farm, and State statistics on production per cow and per hen were established to obtain production per animal by type of farm. In 1935–39, production per cow on hog-dairy farms averaged 233 pounds of butterfat annually compared with 171 pounds per cow on cash-grain farms. Egg production per hen during the same 5-year period was 96 eggs for hog-dairy farms compared with 89 eggs for cash-grain farms. The production of wool on the typical farm was obtained by multiplying the number of sheep in the breeding flock per farm in a given group of counties by the average wool clip and weighting the result by the appropriate weight in table 15.[13]

GOVERNMENT PAYMENTS

Two methods were used to ascertain Government payments on typical farms. In years in which it was possible to employ both methods the results were checked against each other. There was no significant difference in amount of payments shown by the two methods. The first procedure was to obtain total Government payments for the counties representing a given type of farm. These payments were then divided by the usual number of farms (farms reporting the production of corn) in the group of counties, to ascertain payments per farm. These group county averages were then weighted according to the usual weights in table 15 to obtain payments for the typical farm.

The second procedure was to obtain program payments for certain performances such as reduction of corn and wheat acreages and amount of parity payments. Then by the use of the historical record of acreages, yields, hog numbers, etc., on the typical farm, the average performances were computed. This gives the payments for farms

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[13] The production of wool in 1941 for the typical hog-beef raising farm was obtained in the following manner:

$$\left[\overset{\text{Ohio}}{(11.9\text{ sheep}\times 8.1\text{ pounds wool})\times 5\text{ weight}}\right]+\left[\overset{\text{Indiana}}{(4.0\times 7.5)\times 8}\right]+\left[\overset{\text{Illinois}}{(5.5\times 7.9)\times 18]}\right]+$$

$$\left[\overset{\text{Iowa}}{(16.9\times 8.1)\times 34}\right]+\left[\overset{\text{Missouri}}{(22.2\times 6.9)\times 20}\right]+\left[\overset{\text{Nebraska}}{(4.6\times 8.3)\times 15}\right]\div 100=97.95\text{ pounds of wool.}$$

This is an average clip of 7.65 (97.95÷12.8) pounds per animal in the breeding flock. The number of animals in the typical farm flock varies considerably among representative counties in the Corn Belt States. Variation in size was much greater in the sheep enterprise than in any other. This is natural because some farmers had no sheep, whereas others had rather large enterprises. The more common enterprises, such as hogs and poultry, were found on every farm and varied much less from farm to farm within a type of farm.

participating in the Agricultural Adjustment Program. But some farms did not participate and therefore were not eligible to receive payments. As these are representative farms, it is assumed that their participation is about average for the area they represent so average participation was ascertained. Proportion of farms participating, multiplied by the payment per farm participating gives the payment for the typical farm. Government payments were nearly twice as high on cash-grain and hog-beef fattening farms as on hog-dairy and hog-beef raising farms.

Expenditures

Expenditures on typical farms were tabulated, with various items grouped according to type of expenditure such as feeds, livestock, supplies, machinery, buildings, labor, taxes, interest, and services. Prices or rates for the particular items of expenditures are the results of weighting such prices or rates as were reported in the particular State by the usual weights as given in table 15. Each particular item was set up in such a way that an appropriate price and quantity could be established.

FEEDS

Various farm-management studies in the Corn Belt, particularly those dealing with input-output relationships, show the quantity of feed that is required to produce or maintain a unit of livestock under average conditions. This quantity is rather definite although, within the limits of average farm feeding, several feeds may be substituted for each other in rather definite proportions. The degree of substitution depends to a large extent upon the type and class of livestock and the condition maintained. As a result of improved breeding, feeding, sanitation, and other management practices during recent years, the quantity of feed required per unit of livestock has been decreased.

For example, under average feeding conditions and in an average herd in the Corn Belt, where little or no skim milk or other farm by-products are available, it required about 520 pounds of grain to produce 100 pounds live-weight of hogs during the period from 1910 to 1920. Through improved breeding, feeding, and sanitation practices the quantity of grain equivalent required has gradually been reduced by about 25 pounds. In 1935–39, it required about 495 pounds of grain equivalent. Of this, 420 pounds were corn, 30 pounds were oats and other small grains, 27 pounds were oil meals, and 18 pounds were tankage. (One pound of oil meal or tankage was considered equivalent to 3 pounds home-grown grain.) Similar improvements in feeding and management practices have been made with other livestock.

For any 1 year these feed requirements per unit of livestock times the number of units of livestock give the amount of feed required. The amount of home-grown feed required for livestock was deducted from production and inventory in the feed-livestock balance before sales or purchases of feed crops were ascertained. The amount of commercial feeds purchased were obtained directly from requirements per unit of livestock times the number of units of livestock.

The price paid for feeds is the average price paid by farmers for such feeds in the respective States as reported by the BAE weighted by the weights given in table 15.

LIVESTOCK

Power and power-equipment cost is one of the major operating expenditures on typical Corn Belt farms. Formerly this cost was made up largely of horse replacements, horse equipment, and feed. On some farms the type of power and power equipment have changed almost completely from horses and horse equipment to tractors and tractor equipment. For some time, too few colts have been raised on the typical farm for replacements. Because of this it appears more appropriate to establish annual horse expenditures on the basis of an annual outlay for replacement rather than on the basis of raising colts for replacements.[14]

The annual expenditure on the typical farm for replacement of work animals was obtained by applying an annual replacement rate per animal to the value of work animals on the farm each year. The annual replacement rate was obtained from enterprise cost studies in the Corn Belt and ranged from 8 to 16 percent depending on the year and average age of work animals.[15] The average investment (value) in work animals on a typical farm was obtained directly by multiplying the number of work animals by the average value of work animals each year.

Average value per work animal for a given type of farm was ascertained by multiplying the number of work animals per farm in the counties within a State by the average value of work animals in the respective State and then multiplying by the weights in table 15.

The average bull in the typical farm herd is approximately three times as valuable as the average cow. The sire is kept in service 3 years in the same herd and then sold at a price equal to that of the average cow. This indicates that 67 percent of the value of the sire is charged off in 3 years. The annual replacement charge per sire was multiplied by the number of sires in the herd to obtain the annual expenditure for sire replacement.

The average annual expenditure for veterinary and medicine per unit of each type of livestock was obtained from a number of farm management cost-account studies in the Corn Belt. A series of these annual rates was not available for all the years from 1910 to 1942. It was necessary, therefore, to obtain some index-price series appropriate to obtain rates in the years in which no information was available. After some study, the series on index number of prices farmers pay for goods and services used in production was adopted.[16] The resulting rates were employed as prices which when multiplied by the number of units of the particular type of livestock gave the annual expenditure for veterinary and medicine.

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[14] Most recent farm-management studies have approached the problem from an annual depreciation and replacement charge rather than on the basis of raising colts, a procedure that more closely approximates actual practices and is more direct.

[15] This information is based on the number and age distribution of work animals on farms over a period of years. The annual rate is the number of horses required annually to maintain horse numbers from year to year with consideration given to the fact that numbers of work animals may be increasing or decreasing. Also that the average age may be increasing.

[16] This series is published annually by the U. S. Dept. of Agr., Bureau of Agricultural Economics.

The relative amounts of feed ground for different types and classes of livestock were obtained from various farm-management studies on Corn Belt farming. These studies indicate that most of the corn is ground before feeding and that oats and small grain are generally ground only for milk cows, fat cattle, and young poultry. The proportion of each kind of feed ground for each type and class of livestock times the amount of each feed fed to the respective livestock gives the total quantity of feeds ground.

The rate charged for grinding grains for feeding purposes was also obtained from farm-management surveys and cost studies. The rate is usually on a hundredweight basis and is generally the same for all types of home-grown grains. These rates were not available for all years from 1910 to 1942. The rates in the years available were adjusted by the index of prices farmers pay for commodities used in production as reported by the BAE in order to obtain an annual series from 1910 to 1942.

SUPPLIES

The quantities of supplies bought for use in production on the typical farms were obtained directly by applying given rates or requirements to acreages and production in a given year. For example, seeding rates per acre times the acreages seeded each year as obtained from acreages and crop rotations give the amount of seed used each year. Except for small grain seed, the typical farmer does not produce his own seed. For the most part, alfalfa seed, clover seed, and timothy seed are grown only in an occasional year by the average farmer. Hybrid seed corn is produced almost entirely under contract agreement and under special conditions. The typical farmer purchases his hybrid seed corn. In 1942 over 80 percent of the farmers in the Corn Belt proper used hybrid seed corn.

Information on prices paid by farmers for seeds and supplies commonly used are available for most States or regions. Prices reported for these items in the respective States were weighted to obtain prices paid for the particular item on the typical farm.

MACHINE WORK HIRED

In order to operate his farm without considerable handicap, the average farmer must have at least the usual inventory of machinery and equipment, such as plows, harrows, disks, cultivators, wagons, etc. There are, however, some items of special equipment which are too expensive and which are used too few hours during the year to justify the average farmer's maintaining it in his usual array of equipment. The typical farmer must hire the services of this equipment or perform the work by some other method.

All farmers in the Corn Belt do not own mechanical corn pickers. Those who do not own corn pickers generally pick their own corn by hand. The typical farmer does not own a grain combine, a header, and a binder, but he usually has one or the other. If he has a binder or a header, he can hire his threshing. If he has a combine, he can usually harvest his grain for the most part without hiring a thresher.

In this study it is assumed that some farmers have combines and some have binders or headers. The proportion having each was obtained from estimates of the BAE. It is assumed further that those farmers who have headers or binders but do not have combines hire their threshing done. The number of farmers each year having headers and binders times the production of grains gives the amount of threshing hired.[17] This is the only machine hire common enough on Corn Belt farms to be considered.

TRACTOR

There were very few tractors on Corn Belt farms in 1917. By 1941 more than 90 percent of the cash-grain farms had tractors. Less than 40 percent of the hog-beef raising farms had tractors by 1941. In other words, tractors have almost completely displaced work animals as the source of power on some types of farms while work animals remain the important source of farm power on others.

Available information indicates that on the average farm the shift from horses and horse equipment to tractors and tractor equipment is gradual. A tractor and a few important tractor attachments may be purchased and a team of horses and a few items of horse-drawn equipment may be sold in a given year. But for various reasons, financial and operational, two or three horses together with some items of horse equipment are retained for a while after the purchase of the tractor and some tractor equipment. As more tractor equipment is purchased the remaining horses and horse equipment are sold or discarded. This indicates that for a time the farm is operated partly by tractor and partly by horses and that during this transitional period expenditures are incurred for both.

The situation found on cash-grain farms will illustrate this transition from horses and horse equipment to tractors and tractor equipment. From 1910 to 1913, 100 percent of the cash-grain farms were operated with horses. By 1925, 67 percent of the farms were horse operated and 33 percent were tractor operated. The number of tractor operated farms continued to increase relative to the number of horse operated farms until 1931 when, on account of the depression and low prices of farm commodities, it became difficult for farmers to purchase tractors and tractor equipment. But when prices and farm income began to rise in 1934 and 1935, farmers began to purchase more tractors. By 1941, 93 percent of the cash-grain farms were operated with tractors and 7 percent were operated with horses.

Thus from 1910 to 1913 cash-grain farmers had no tractor expense; all farms were horse operated. But, from 1914 to 1942 some cash-grain farmers had only horse expense, some had only tractor expense, and some had both tractor and horse expense. The expense for horses has already been given in horse replacements, feed, veterinary and medicine.

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[17] The amount of grain combined each year has gradually increased, and the amount threshed has decreased. For example, in 1928 about 2 percent of the small grains were combined and 98 percent were threshed on cash-grain farms. In 1940 about 40 percent were combined and 60 percent were threshed. This means that the expenditures for threshing have decreased and the expenditures for combines and combine equipment have increased. The value and use of straw have been important enough on livestock farms to retard the use of combines. Also livestock farms in general have less acreage in grains than cash-grain farms and therefore have not been able to make as effective use of mechanical power and equipment. The development of mechanical power and power equipment suitable for use on small farms has been a recent innovation.

Tractor expenditures consist of operating and replacement expenditures. Operating expenditures were obtained by multiplying the hours of tractor operation per year by the operating cost per hour. The hours of tractor use each year on the typical farm were obtained as follows: First, the number of hours of tractor work required to perform certain operations each year were obtained. Second, these requirements times the acreages of the various crops each year gave the hours of tractor work required to operate the farm provided tractors were the only source of farm power. Third, the proportion of farms having tractors times the hours of tractor work, given in step two, gives the hours of tractor work performed annually on the typical farms.

Tractor operating costs are those costs which are a function of use, costs which vary directly with use. Studies indicate that under average farming conditions operating costs per tractor remain about the same per hour of use regardless of the amount of use. This being the case, the hours of tractor use on the typical farm times the operating costs per hour in the respective year gives the annual tractor operating costs on the typical farm.[18] In 1941 tractor operating expense on the typical cash-grain farm amounted to $196.23 (633 hours × 31 cents).

The fact that there has been an increase in the number of tractors on typical farms indicates that there has been an outlay for new or additional tractors as well as an outlay to replace those that have become obsolete or worn out. Consequently, tractor replacement expenditures were handled as new and as replacement.

The annual outlay for new tractors was obtained directly by multiplying the average price farmers pay for tractors by the percent increase in the number of tractors in a given year over the previous year. For example, 25.7 percent of the typical hog-dairy farmers had tractors in 1934. In 1935, 29.2 percent had tractors; an increase of 3.5 percent (29.2−25.7) over 1934. The addition of 3.5 percent tractors times the average price ($985) farmers paid for tractors in 1934 gives the expenditure ($985×0.035=$34.48) for new tractors in 1934.

The annual outlay for replacement of tractors was obtained in the following manner. First, a mortality rate was established by computing a ratio of the number of tractors discarded each year to the number of tractors on farms at the beginning of the year. Second, this mortality rate was applied to the percentage of typical farms having tractors. Third, the resultant product times the price farmers paid for tractors in the given year gives the outlay on the typical farm for tractor replacements. For example, in 1935, 4.3 farm tractors were discarded for each 100 tractors on farms at the beginning of the year.[19] In 1934, 25.7 percent of the typical hog-dairy farms were operated with tractors. The mortality rate of 3.1 percent times the percent (25.7) with tractors gives a replacement rate of 0.008 (0.031×0.257). The replacement rate times the price paid for farm tractors in 1935 gives a tractor replacement expenditure of $7.88 ($9.85×0.008).

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[18] Tractor operating costs per hour were obtained from various studies in which prices of gasoline, fuel oils, and motor oils were comparable.

[19] See also U. S. BUREAU OF AGRICULTURAL ECONOMICS. INCOME PARITY FOR AGRICULTURE. PT. 2. EXPENSES OF AGRICULTURAL PRODUCTION. SEC. 3. PURCHASES, DEPRECIATION, AND VALUE OF FARM AUTOMOBILES, MOTORTRUCKS, TRACTORS, AND OTHER FARM MACHINERY. CALENDAR YEARS 1910–39. 74 pp. Washington, D. C. 1940. [Processed.]

MACHINERY AND EQUIPMENT REPLACEMENT

Expenditures for machinery and equipment, new and replacement, include the annual outlay for numerous items such as plows, harrows, disks, cultivators, weeders, mowers, milking machines, corn pickers, binders, drills and combines. They do not include expenditures for motor vehicles such as tractors, trucks, and automobiles. Some items that were unknown in 1910 are very important today and some items common in 1910 are not important today. Because so many items are included in machinery and equipment, it is impracticable to attempt to obtain an annual expenditure (quantity and price) for each item.

The value of machinery and equipment exclusive of motor vehicles per farm and per crop acre by type of farm was obtained from census data and farm-management studies.[20] Annual expenditures for machinery and equipment replacement and the corresponding gross farm income were also obtained and a relationship established between annual machinery and equipment expenditure and gross farm income. The information indicated that there is a high correlation between gross farm income and farmers' expenditures for machinery and equipment items. The price of any particular item of machinery and equipment is usually not so excessive that the farmer is not able to purchase the item outright in a normal year. This, of course, is not true of tractors, trucks, and automobiles. Moreover, there is generally a large array of these items on the average farm and the farmer avoids replacing many of these items in any one year. If allowance is made for change in gross farm income, the annual outlay for machinery and equipment items is generally fairly constant.[21] This indicates that on the whole the replacement of these items is fairly constant and that with some exceptions (mostly variations in income and technological developments) a certain replacement rate could be established.

But because of these important exceptions an annual replacement rate alone will not satisfy the situation. For example, an annual replacement rate of 8 percent may establish a normal rate for a given period on a hog-dairy farm but it requires something in addition to account for increased expenditures when milking machines, corn pickers, combines, and ensilage cutters come into general use. It also requires something in addition to measure machinery replacement expenditures when farmers defer replacing machinery during depressions and droughts and resulting low incomes. Gross farm income appears to be the appropriate index to measure year to year changes in machinery expenditures.

Machinery and equipment expenditures for a typical farm were obtained in the following manner: First, expenditures for given years were obtained from farm management studies and from replacement rates. The latter was obtained by establishing relationships between value of certain items of machinery and equipment on a given type of farm and annual expenditures for replacement of these items. Second, relationships were established for the same years between gross farm income and the amount spent for replacement of machinery and equipment. The relationship between gross farm income and machinery expenditures was applied to the gross farm income on a typical farm to obtain machinery expenditures in a year for which such expenditures were not otherwise given.

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[20] U. S. Bureau of the Census. census of agriculture, 1910–40. The information from the census was tabulated by counties representing the respective types of farms.

[21] There is a tendency for gross farm income and purchases of machinery and equipment items to move up or down together. Drought years and local misfortunes are exceptions.

For example, farm-management studies showed that in 1930 cash-grain farms with organizations and incomes similar to the cash-grain farms represented here spent $113 for machinery and equipment exclusive of motor vehicles. These farmers had a gross income of slightly over $3,300 in this year. In the same year the investment in machinery and equipment amounted to about $1,400. In other words, in 1930 these farmers spent about 3.4 percent of their gross income for machinery and equipment. Their outlay for these items amounted to about 8.5 percent of the investment in machinery and equipment at the beginning of the year. Similar relationships were established for other years.

In 1930, the gross farm income of the typical cash-grain farmer was also $3,300. On the assumption that he replaced machinery at the same rate or spent the same proportion of his gross income for machinery as similar farmers, he would spend $112 ($3,300 × 0.034) for machinery and equipment in 1930.

This was the amount spent. The items purchased in such a list differ considerably in price. Prices paid and quantities purchased (both necessary in the computations of the index series later) were represented by index numbers. The amount spent for machinery and equipment was divided by the index number of prices farmers pay for machinery other than motor vehicles to obtain the index of quantity purchased ($113 ÷ 152 = 74).[22]

AUTOMOBILE

Practically every family-sized farm in the Corn Belt now has an automobile. About 30 years ago very few of them had autos. This means that much of the business of buying and selling of livestock and crops, of negotiating for new machinery and equipment, of obtaining repair parts for old machinery and equipment and dozens of other jobs which were formerly done with horse and carriage are now done with automobiles. The automobile has now come to be considered as an essential item in farm production. This is particularly true of livestock farms.

The average farmer, however, also uses his automobile for personal and family business. It is difficult in many instances to ascertain whether a particular assignment in which the auto is used is farm business or personal business or both. In most studies, as in this one, half of the auto expenditure is charged to the farm business.

In general, livestock farmers have more use for an automobile in their business than cash-grain farmers. In the Corn Belt, however, the typical cash-grain farm has some livestock and is larger than typical livestock farms. The need for the services of an automobile is perhaps as great on one type of farm as another. The percentage of farms with autos, however, differed among types of farms.[23]

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[22] U. S. BUREAU OF AGRICULTURAL ECONOMICS. INCOME PARITY FOR AGRICULTURE. PT. 3. PRICES PAID BY FARMERS FOR COMMODITIES AND SERVICES. SEC. 4. PRICES PAID BY FARMERS FOR FARM MACHINERY AND MOTOR VEHICLES, 1910–38. 24 pp. Washington, D. C. 1939. [Processed.] See p. 11.

[23] The number of farms in each type group with autos was based on county and State estimates as obtained from the U. S. BUREAU OF THE CENSUS, CENSUS OF AGRICULTURE, 1920–40, AND STATE PUBLICATIONS.

The annual auto operating expense was obtained by multiplying the number of miles the auto is driven in farm use by the operating cost per mile. The average number of miles the auto is driven on the typical farm was obtained by multiplying the average number of miles farm autos are driven annually by the percentage of farms of a given type with autos (miles per auto × percent farms with autos = miles driven per farm).[24]

Operating costs include such items as fuel, oil, grease, and tires. These costs per mile in any given year remain about the same under average conditions of farm use or miles driven. Farm automobile operating costs per mile for the United States were available from 1910 to 1940.[25] Prices of gasoline, motor oil, and tires were obtained for given years for the Corn Belt and for the United States. Auto operating costs on typical Corn Belt farms were then obtained by adjusting auto operating costs in the United States by the relationship of gasoline, motor oil, and tire prices in the United States to those in the Corn Belt.

Approximately 95 percent of typical farmers in the Corn Belt now have automobiles compared to about 10 percent in 1915. This indicates that there has been an outlay for autos on some farms where autos were never owned before as well as an outlay for replacement of automobiles that have been discarded.

The annual outlay for purchases of new or additional automobiles was obtained directly by multiplying the average price farmers pay for automobiles in a given year by the percentage increase from the previous year in number of farms with automobiles. For example, on January 1, 1919, 54 percent of cash-grain farmers had automobiles. A year later (January 1, 1920) 64 percent had automobiles. This means that during the calendar year of 1919, 10 out of every 100 cash-grain farmers added an auto to their farm business. The average price paid for these automobiles was $825.[26] In 1919 the typical cash-grain farmers spent on the average $82.50 ($825×0.10) for new or additional automobiles.

In addition to the outlay for the new or additional automobiles, there was an outlay for the replacement of automobiles worn out or discarded by cash-grain farmers in 1919. Almost 9 percent (8.9) of the automobiles on cash-grain farms January 1, 1919, were replaced during the year.[27] Some of these were replaced with new cars and some were replaced with used cars. The weighted average price of the cars was $700.[28] The average outlay for replacement of automobiles in 1919 was $33.64 [0.089×0.54 (700)]. Of course only one-half of the auto expense is charged to the farm business.

Several years ago there were so few cars on farms, in rural communities, and on rural thoroughfares that farmers operating automobiles felt little necessity of carrying automobile insurance. The situation has changed, and today the average insurance fee per farm automobile is approximately $9 per year.[29]

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[24] The average number of miles farm autos are driven annually was obtained from a series adjusted for local differences and given in U. S. BUREAU OF AGRICULTURAL ECONOMICS INCOME PARITY FOR AGRICULTURE. PT. 2. EXPENSES OF AGRICULTURAL PRODUCTION. SEC. 4. FARMERS' EXPENDITURES FOR OPERATING AUTOMOBILES, MOTORTRUCKS, AND TRACTORS. CALENDAR YEARS 1910–39. 49 pp. Washington, D. C., 1940. [Processed.]

[25] See footnote 24.

[26] U. S. BUREAU OF AGRICULTURAL ECONOMICS. INCOME PARITY FOR AGRICULTURE. PT. 2. EXPENSES OF AGRICULTURAL PRODUCTION. SEC. 3. PURCHASES, DEPRECIATION, AND VALUE OF FARM AUTOMOBILES, MOTORTRUCKS, TRACTORS, AND OTHER FARM MACHINERY. CALENDAR YEARS 1910–39. 74 pp. Washington, D. C., 1940. [Processed.]

[27] See footnote 26.

[28] See footnote 26.

The average license fee per farm automobile has more than doubled during the last 30 years. In 1910–14 the average license fee was less than $5; in 1941 the fee was over $12.[30] While the average annual expenditure for insurance and license is not large, it is definitely part of the expense of operating a farm.

The annual insurance and license expenditure for the typical farm was obtained by multiplying the average insurance and license expense per automobile by the respective percent of farms with automobiles. For example, in 1939 the average insurance and license expense per farm automobile was $8.50 and $9.81, respectively. In 1939, 86 percent of the typical hog-dairy farmers had automobiles. The typical hog-dairy farmer paid $7.31 ($8.50×0.86) for car insurance and $8.44 ($9.81×0.86) for car license in 1939. Half of these amounts were charged to the farm business.

BUILDING

Available information indicates that the average investment (or value) in buildings exclusive of dwelling per farm has practically doubled in the last 30 years. Part of this increase has been due to inflated prices as indicated by the rather sharp increase in value of farm buildings from 1920 to 1930 but part has been due to additions and improvements to the building outlay to accommodate increased livestock, cropping, and machinery shelter programs on typical farms.

This increase in the farm-building program has meant an increase in annual expenditures for building maintenance on the typical farm. The most noticeable increase in these annual expenditures is on typical cash-grain farms where there has been a substantial increase in the cropping and livestock programs. The Ever-Normal Granary and the corn-sealing programs have added to the building program on these farms. For example, in 1940 expenditures for upkeep and replacement of buildings on typical cash-grain farms amounted to more than $140 compared with $100 during the years 1928, 1929, and 1930. The gross farm income was about the same in all 4 years.

The annual building expenditure on typical farms was estimated in the following manner. First, the average value of or investment in farm buildings exclusive of dwelling was estimated for each year from 1910 to 1942 for each of the types of farms. This information was obtained from census data for the respective counties representing specific types of farms and from farm-management and local studies. Second, a normal replacement was obtained by multiplying the value of farm buildings exclusive of dwellings each year by 4 percent. Third, a ratio of normal building replacement expenditures to gross farm income was obtained for the 33-year period 1910–42. Fourth, this ratio was applied to gross farm income each year to obtain annual building expenditures.

This procedure gives results which appear to be in line with average farm operations. When income is low because of depressions, or droughts, expenditures for many items, such as upkeep or replacement of buildings, are deferred. But, when income is above normal, expenditures for such items are usually increased.

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[29] U. S. Bureau of Agricultural Economics. INCOME PARITY FOR AGRICULTURE. PT. 2. EXPENSES OF AGRICULTURAL PRODUCTION. SEC. 4. FARMERS' EXPENDITURES FOR OPERATING AUTOMOBILES, MOTORTRUCKS, AND TRACTORS. CALENDAR YEARS 1910–39. 49 pp. Washington, D. C., 1940. [Processed.] Information from local studies seemed to correspond to the series published in this source.

[30] See footnote 29.

LABOR

In spite of the fact that the typical Corn Belt farm is a family sized unit in which the family supplies most of the labor force, almost $1 out of every $5 of expense is for hired labor. In the early "teens" the family supplied nearly 90 percent of the labor on typical farms. However, by 1940 the farm family supplied from 75 percent to 90 percent of the labor requirements, varying widely by types. About three things have happened since the early "teens" to change this picture: (1) A general increase in the size of the typical farm and the volume of output; this has meant an increase in the amount of labor required. (2) A slight but general decrease in the size of the typical farm family; this has meant less family labor. (3) The introduction of labor-saving machinery and equipment; this has meant an increase in output per laborer. These have been important factors in determining the volume of labor required and hired.

In order to get true and representative labor requirements for typical farms, it was necessary to obtain labor requirements for the smallest area or local unit for which information on livestock, crops, and farm organizations were available and then by proper weighting build up appropriate estimates for the typical Corn Belt farm. Therefore, with due consideration to crop acres per farm, size of herd, total production, extent of mechanization, and methods of production, labor requirements per unit of livestock and crops were ascertained for each of the groups of counties representing the respective types of farms. These annual labor requirements were then multiplied by the respective numbers of livestock and acres of crops per farm in each of the groups of counties representing a given type of farm. The result was then multiplied by the appropriate weights in table 15.[31] The total hours utilized annually in the production of crops and livestock together with time spent in keeping up buildings, equipment, and machinery were distributed monthly to obtain seasonal labor requirements for the respective types of farms.[32]

The hours of labor required for each crop, each type and class of livestock, and for upkeep of buildings, machinery, and equipment each month, were added together to obtain the total hours of labor required to perform the farm work in that month. The amount of labor hired each month was then obtained directly by subtracting the hours of family labor available each month from the total hours of farm labor required each month. In most winter months the amount of family labor available was more than adequate to handle the work on the typical farms.

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[31] The following example illustrates the procedure. Total hours of man labor required to grow and harvest an acre of corn in 1938 on typical hog-beef raising farms:

$$\left[\begin{matrix}\text{Ohio}\\(37.9\ \text{acres}\times 27.5\ \text{hours})\times 6\ \text{weight}\end{matrix}\right]+\left[\begin{matrix}\text{Indiana}\\(30.2\times 16.5)\times 10\end{matrix}\right]+\left[\begin{matrix}\text{Illinois}\\(40.8\times 15.3)\times 18\end{matrix}\right]+$$

$$\left[\begin{matrix}\text{Iowa}\\(30.0\times 14.6)\times 34\end{matrix}\right]+\left[\begin{matrix}\text{Missouri}\\(19.2\times 19.3)\times 20\end{matrix}\right]+\left[\begin{matrix}\text{Nebraska}\\(64.0\times 14.0)\times 12\end{matrix}\right]\div 100=555.28\ \text{hours.}$$

The average per acre is 16.14 hours (555.28÷34.4).

[32] Labor requirements and seasonal distribution of labor were obtained from local farm management and input-output studies.

The amount of available family labor by months on the typical Corn Belt farm was determined by two factors: (1) The number of persons of each sex and age in the family; (2) the available time and effectiveness of each of these persons in performing farm work during each month. According to the census of population, in 1910, the average farm family in the Corn Belt consisted of 4.85 persons. The number of persons per family has gradually decreased since then and was 4.05 in 1940.[33] It is assumed, therefore, that the typical farm family consisted of 2 parents and 2.85 children in 1910 and 2 parents and 2.05 children in 1940.

There were 1.21 children around 16 years of age and 1.21 children 10 years of age or under in the average Iowa farm family in 1930.[34] It was assumed that this age distribution was maintained in the family and that the amount of available labor each year from children changed with the relative change from 1930 in number of children. For example there were 2.85 children per farm family in 1910 and 2.42 children in 1930, or a decrease of 15.1 percent. Therefore, the available labor from children was reduced by 15.1 percent from 1910 to 1930.

It was assumed that children approximately 16 years of age are about one-half as effective as a man in performing field work and about as effective as a man in chore work. The child is available for full-time work or about 250 hours during summer months, but in winter months, because of attending school, short days, and inclement weather, works only about 60 hours. Even though the operator's time is not so effective during winter months there is usually more than enough family labor to do the farm work in this season. Total family labor runs from approximately 280 hours in January and February to over 400 hours in midsummer.

The character of the work performed on these farms by hired labor is general farm work which is similar to work performed on the general run of farms in the Corn Belt States. Therefore, seasonal wage rates for the Corn Belt States were weighted according to the weights in table 15. The wage rate for hired labor for the respective type of farm times the days of labor hired on that farm gives the expense for hired labor.[35]

TAXES

The typical farm operator is now paying more than twice as much in farm taxes as he was 30 years ago. There are two reasons for this: (1) An increase in tax rates; (2) an increase in the amount of taxable property. In 1941 farm taxes amounted to 8.3 percent of total farm expenditures on hog-dairy farms and 15.2 percent on cash-grain farms.[36]

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[33] TRUESDELL, L. E. FARM POPULATION OF THE UNITED STATES. (1920.) Census Monograph VI, 536 pp., illus. 1926. See table 8. Because the number of farm homes in 1910 as given in the Census Monograph was less than the number of farms, farm population estimates were divided by an estimated number of farm homes. The estimated number of farm homes was slightly greater than the number of farms. The number of persons per farm family for the West North Central States was taken to represent the Corn Belt. Information for the modal or typical farm family was not available. For this reason the mean or average size family was used.

[34] U. S. BUREAU OF THE CENSUS. CENSUS OF POPULATION, 1930.

[35] A 10-hour day is considered typical for these farms.

[36] The difference in taxes as a percentage of total farm expense on the two types of farms is due mostly to the differences in amounts of various other expenditures rather than to differences in rates and amounts of property. Feed and livestock expenses are relatively more important on hog-dairy farms than on cash-grain farms.

The amount of farm taxes paid by the typical farmer each year was obtained by multiplying the number of acres in the farm by the respective annual tax rate per acre of land including buildings and equipment. The acres per farm were taken directly from the tabulation on size of farm and use of land. The tax rate is the weighted average tax rate per acre for the counties representing the respective types of farms. The weighted tax rate was obtained by multiplying the tax rate in the group of counties by the average acres per farm in those counties and by the respective weights in table 15. The sum of the products was then divided by the sum of the acreages and weights.[37]

INTEREST

Interest payment as estimated in this study is the amount of interest actually paid on farm obligations, and not the amount owed or the computed interest on investment. It was probably the most difficult item of expense to compute. Considerable experimenting and checking was done in connection with developing the present procedure. Information on farm interest payments was available from several local studies that might be considered representative of the farm organizations presented in this study. This information was available for only a few years. It was found, however, that on the average a rather definite relationship exists between income, investment in real estate, and interest paid.

Information on the estimated amount of farm-mortgage loans outstanding, the estimated amount of interest charges payable on farm mortgages and the average rates of interest charged on such mortgages is available for the United States and for geographic divisions from 1910 to 1941.[38] Information on investment in land, buildings, and equipment is also available for these geographic divisions. The average interest charges payable per farm on mortgages outstanding and the average investment in land, buildings, and equipment were obtained from this information for the North Central States.[39]

A relationship was then established between the investment in land, buildings, and equipment on the average farm in the North Central States and on each of the typical farms. Annual interest payments for the typical farm were then obtained by multiplying this relationship for the particular type of farm by the interest charges payable on the average farm in the North Central States and adjusting annually by income. It was assumed that the same rate of interest prevails on all farm mortgages outstanding regardless of type of farm within this geographic division. The annual interest payments divided by the interest rates gives the amount of mortgage on which interest payment was made. The obligation on which interest payment was made gives the appropriate weight for interest payments in the total index of farm expenditures.

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[37] State and county tax rates together with tax rates as given in local studies were adjusted to obtain a series of county estimates of tax rates. The equation for obtaining the weighted tax rate is:

$$\frac{[(\text{acres} \times \text{rate} \times \text{weight}) + \ldots\ (\text{acres} \times \text{rate} \times \text{weight})]}{[(\text{acres} \times \text{weight}) + \ldots\ (\text{acres} \times \text{weight})]} = \text{weighted tax rate.}$$

[38] U. S. BUREAU OF AGRICULTURAL ECONOMICS. Agricultural Finance Review. Vol. 3, No. 1, May 1940. Statis. Sup., table 8, p. 73.

[39] The counties covered in this study all fall within this geographic region.

FARM SERVICES

There are two services which have become common enough on typical Corn Belt farms to be considered as items of expense. As early as 1920 well over three-fourths of the typical farms had telephones. By 1920 approximately 80 percent of the typical hog-dairy and cash-grain farms, 90 percent of the hog-beef breeding and fattening farms and 75 percent of the hog-beef raising farms had telephones. Less than 5 percent of these farms had electricity by 1920. However, electrical service to farms has become considerably more common and nearly 60 percent of the typical farms had electric service by 1941. During the depression several farmers discontinued telephone service. These farm services, however, have increased again. The total annual expenditure for these services on the typical farm is not large.

In this study half of the farm telephone bill is charged to the farm business and half to family living. The annual expense is obtained by multiplying the weighted annual rate for farm telephone service by the percentage of farms in a particular type with telephone service.

The percentage of farms by type having telephone service was developed by weighting county and State statistics on percentage of farms with telephones.[40] Information on number of farms with such service was not available for all years from 1910 to 1942. The interim years (usually not over 3 or 4 years) for which no data were available were estimated by assuming a straight line trend. Each type group of counties within a State was then weighted with the usual weights in table 15 to obtain the percentage of farms by type having telephones.

Available information on telephone rates for specified services indicated that there was no appreciable difference in rates between States or between counties in the Corn Belt proper. Rates for all States and for all types of services are not available. As a result, rates for specified States for three common types of services (urban commercial, farmer or rural, and mutual) were obtained.[41] These rates were then weighted according to the percentage of each kind of service on farms. The results indicated that there was no significant difference in the weighted average rate between States. For this reason the same rate was applied to all types of farms. The weighted average rate ranged from about $15 per year in 1910–14 to approximately $25 in 1920. The rates began to decline after 1920 and were about $17 per annum in 1937–41.

During the last 5 years (1938–42) the typical Corn Belt farmer spent twice as much for electrical current as he did 10 years ago and six times more than he did 20 years ago. During this time there has been a steady decline in electrical rates to farmers and a steady increase in consumption of electricity per farm. In 1920 the average rate per kilowatt hour was 9.31 cents and the average consumption was 454 kilowatt hours. By 1942 average consumption had increased to 1,350 kilowatt hours but the rate had declined to 4.2 cents per unit. The number of farmers using electrical service has also increased rapidly since 1920.

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[40] UNITED STATES CENSUS OF AGRICULTURE, 1910–40. U. S. BUREAU OF AGRICULTURAL ECONOMICS. INCOME PARITY FOR AGRICULTURE. PT. 3. PRICES PAID BY FARMERS FOR COMMODITIES AND SERVICES. SEC. 3. TELEPHONE RATES TO FARMERS IN THE UNITED STATES, 1910–14, 1924–29, 1932, AND 1935–36. 13 pp. Washington, D. C. 1938. [Processed.]

[41] See footnote 40. Rates for interim years were obtained by adjusting the rates in the years given by the index of prices farmers pay for equipment and supplies. (Agr. Statis., U. S. Dept. Agr., 1942. Table 723, p. 647.)

The percentage of typical farms having electrical service was obtained by the following three steps: (1) The general trend in percentage of farms by type having electrical service was obtained by weighting information on percentage of farms in the six Corn Belt States and in selected counties having such service by the weights in table 15;[42] (2) the level of percentage of farms by type having such service was obtained for several periods for representative counties; and (3) the general trend as obtained in step (1) was applied to the levels as obtained by step (2).

Part of the electrical current used on farms is used in farm dwellings, and should not be charged against the farm business. The number of kilowatt-hours of electricity used for farm purposes was obtained by subtracting the kilowatt-hours used in farm dwellings east of the 100th meridian from the total kilowatt-hours used on farms in the same area as reported by the Edison Electrical Institute. This gives the average kilowatt-hours of electricity used for farm purposes on farms which have electrical service. However, as shown above, many farmers do not have such service. The average annual consumption of electricity for farm use on typical farms by type was obtained by multiplying the average consumption per farm having electrical service by the percentage of farms in each type having such service.

A series of cost rates for electrical service for representative counties or for States was not available. Moreover, it was felt that if there were any differences in rates to farmers in the Corn Belt by counties or States the differences would be slight, and that weighting such rates to obtain average weighted rates for each type of farm would completely eliminate any differences. As a result, a series of cost rates to farmers east of the 100th meridian compiled from annual bulletins of the Edison Electrical Institute, was employed to represent cost rates to typical farmers in the Corn Belt. Annual expenditures for electrical service were obtained by multiplying the annual consumption by the respective cost per kilowatt-hour.

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[42] Information for the six Corn Belt States was obtained from annual reports of the Edison Electrical Institute and Committee on Relation of Electricity to Agriculture. Information for the representative counties was obtained from the United States Census of Agriculture, 1910–40.

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